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H. O. No. 141

SCANDINAVIA PILOT

Volume II

THE KATTEGAT TO CAPE ARKONA, INCLUDING THE SOUND, THE GREAT AND LITTLE BELTS, AND KIEL BAY

PUBLISHED BY THE HYDROGRAPHIC OFFICE
UNDER THE AUTHORITY OF THE
SECRETARY OF THE NAVY

FIRST EDITION

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

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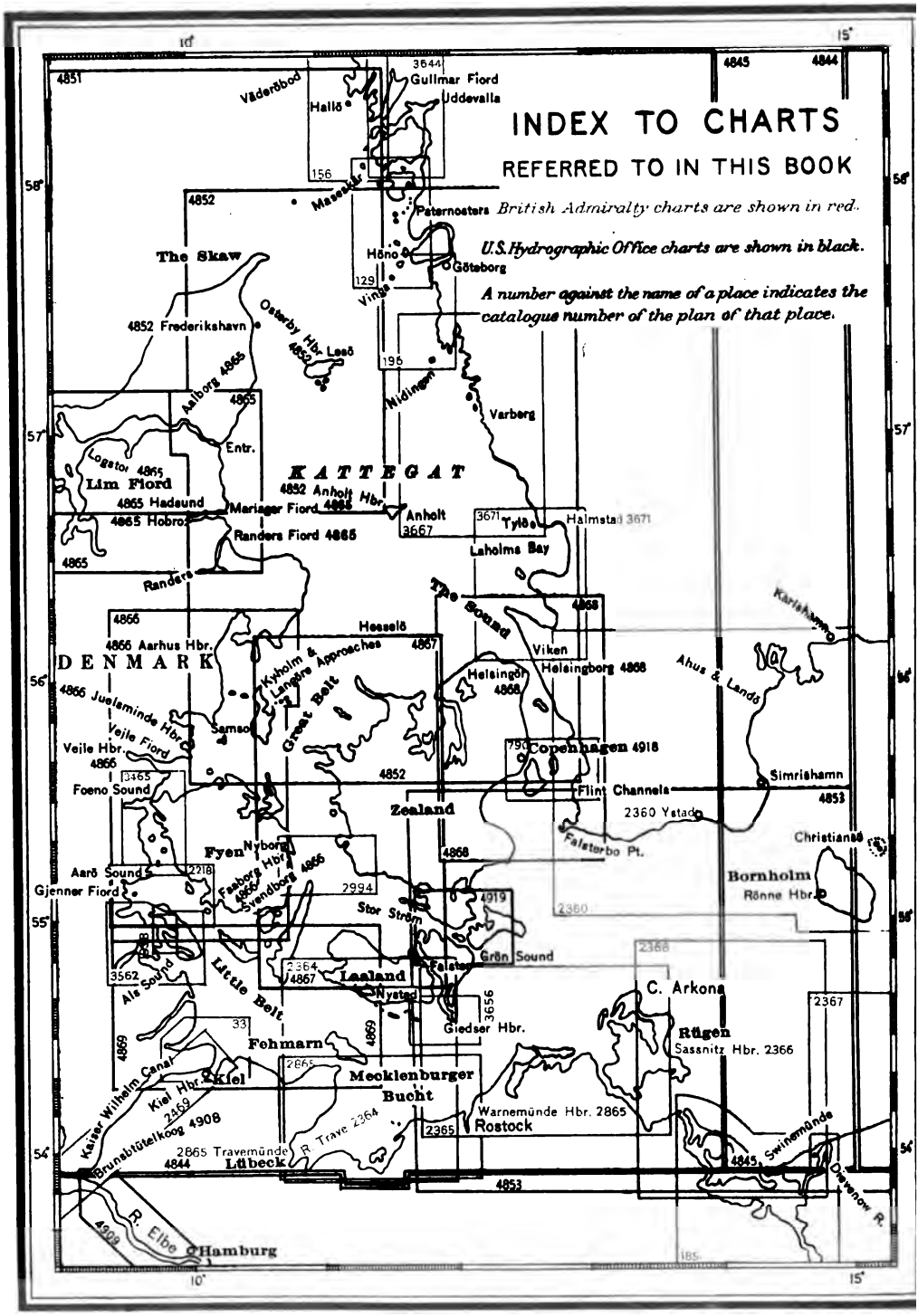
INDEX TO CHARTS
REFERRED TO IN THIS BOOK
British Admiralty charts are shown in red.
U.S. Hydrographic Office charts are shown in black.
A number against the name of a place indicates the catalogue number of the plan of that place.
KATTEGAT
DENMARK
Zealand
Lealand
Fyen
Fehmarn
Bornholm
Rügen
The Skaw
Frederikshavn
Lim Fiord
Hadsund
Hobro
Mariager Fiord
Randers Fiord
Randers
Aalborg
Ostersby Hbr.
Anholt
Anholt Hbr.
Nidingen
Varberg
Laholms Bay
Halmstad
Tylö
Viken
Helsingborg
Helsingör
The Sound
Hesselö
Kyholm & Langelre Approaches
Aarhus Hbr.
Juelsminde Hbr.
Veile Hbr.
Veile Fiord
Samsö
Great Belt
Foeno Sound
Nyborg
Faaborg Hbr.
Svendborg
Aarö Sound
Gjenner Fiord
Als Sound
Little Belt
Stor Strøm
Falster
Grön Sound
Nysted
Gedser Hbr.
Copenhagen
Flint Channels
Falsterbo Pt.
Ystad
Ahus & Landö
Karlshamn
Simrishamn
Christianö
Rönne Hbr.
C. Arkona
Sassnitz Hbr.
Kiel
Kiel Hbr.
Kaiser Wilhelm Canal
Brunsbüttelkoog
Mecklenburger Bucht
Warnemünde Hbr.
Rostock
Travemünde
Lübeck
R. Trave
Swinemünde
Dwarsnow R.
R. Elbe
Hamburg
Gullmar Fiord
Uddevalla
Göteborg
Vinga
Paternosters
Hönö
Väderöbod
Hallö
Masesär

PREFACE.

This publication comprises the sailing directions for the Kattegat, The Sound, The Great and Little Belts, and the channels leading therefrom to the Baltic. The east coast of Jutland, the west coast of Sweden from Marstrand Fiord south, the coasts of Schleswig-Holstein, Mecklenburg-Schwerin, and Pomerania as far east as Cape Arkona, and the large islands of Fyen and Zealand, together with smaller ones surrounding them, are described.

The information contained herein is taken mainly from Baltic Pilot, Part I, published by the British Admiralty. It contains the latest information from all reliable sources and includes hydrographic notices to mariners relating to the area of which it treats up to and including No. 5 of 1916.

The text has not been altered to conform to changes incident to the war, such as location of mine fields, extinguishing of lights, etc., information concerning which has been published from time to time. These have been considered of a temporary character, and the notices to mariners containing such information will have to be consulted in connection with the text.

The bearings and courses are true, in degrees from 0° (north) to 360°.

Bearings limiting the sectors of lights are toward the light.

The directions of winds refer to the points from which they blow; of currents, the points toward which they set. These directions are true.

Variations for the year, with the annual rate of change, may be obtained from H. O. Chart No. 2406, Variation of the Compass.

Distances are expressed in nautical miles, the mile being approximately 2,000 yards.

Soundings are referred to low-water ordinary springs unless otherwise stated.

Heights are referred to mean high water, spring tides.

Details of lights, except buoy lights, should be taken from the latest light lists and charts, as no attempt has been made to cover these details in this volume.

The return coupons in the front of the book should be sent in at the expiration of the years shown on them.

In the interest of mariners, information regarding inaccuracies in this publication should be sent to the United States Hydrographic Office, Washington, D. C.

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GLOSSARY.

DANISH TERMS.

Danish.	English.	Danish.	English.
Aa	River.	Kystvagt	Coastguard.
Aas	Ridge.	Lille	Little.
Baake	Beacon.	Löb	Channel.
Bæk	Brook.	Lods	Pilot.
Baae	Rock (sunken).	Lund	Grove.
Bakke	Hill.	Lysthus	Summerhouse.
Bank	Bank (shoal).	Mærke	Mark.
Bjerg	Mountain.	Mellem	Between.
Borg	Fortified place.	Midterst	Central.
Bredning	Wide place in a river or channel.	Misvisende	Magnetic.
		Misvisning	Variation (compass).
Bro	Bridge or pier.	Mölle	Mill.
Bugt	Bend (in the coast).	Mund, Munding	Mouth.
By	Town.	Nakke	Nape (of neck).
Dæmning	Breakwater or mole.	Nes, Næs	Cape, point.
Dampskib	Steam vessel.	Næse	Nose.
Dyb	Deep.	Næb	Beak.
Elv	River.	Nor	Shallow sheet of water, connected with the sea.
Færge	Ferry.		
Farlede	Channel.		
Farvand	Channel.		
Flod	River.	Nord	North.
Fyr	Light.	Nörre	Northern.
Fyrhus	Lighthouse.	Ny	New.
Fyrtaarn	Light-tower.	Ö	Island.
Fyrskib	Lightvessel.	Odde	Cape point.
Gaard	Farm, sometimes country house.	Öre	Ear.
		Orlogman, Orlogsskib	War vessel.
Gamle	Old.		
Gab	Opening.	Öst, Öster	East.
Grund	Shoal.	Östre	Eastern.
Hage	Hook (as of Holland) or hook pointed shoal.	Östers	Oyster.
		Pille	Pier, sometimes pillar or column.
Hale	Tail.	Plade	Flat.
Hals	Neck.	Pynt	Point of land.
Halvö	Peninsula.	Radiotelegraf	Wireless telegraph.
Hav	Sea.	Raket	Rocket.
Havn	Harbor.	Rednings station	Life-saving station.
Höi, Hoj	High or hill.	Red	Roadstead.
Holm	Islet.	Rende	Channel.
Hoved	Head.	Retvisende	True.
Indre	Inner.	Rev	Reef.
Inderst	Innermost.	Revle	Ledge, bar.
Indlöb	Entrance.	Sand	Sand.
Indsö	Lake.	Seilskib	Sailing vessel.
Jernbane	Railway.	Skanse	Fort.
Kai	Quay.	Skjær	Rock above water.
Kalv	Calf.	Skjærgaard	Fringing rocks, islets and shoals.
Karantæne	Quarantine.		
Kirke	Church.	Skov	Wood.
Klint	Summit or brow of a steep hill or cliff.	Skrænt	Slope, bluff.
		Slot	Castle.
Klippe	Cliff or rock.	Sö	Sea or lake.
Klit	Sandhill.	Sökort	Chart.
Kratskov	Thicket.	Söndre	Southern.
Krigsskib	War vessel.	Spids	Point.
Kyst	Coast.	Stad	Town.

DANISH TERMS—Continued.

Danish.	English.	Danish.	English.
Stang	Pole.	Toldvagtning	Customs service.
Sten	Stone.	Tunge	Tongue.
Stor	Great.	Val	Steep coast.
Sund	Sound.	Vest	West.
Syd	South.	Vestre	Western.
Taage	Fog.	Vig	Creek, bay.
Tang	Seaweed.	Vrag	Wreck.
Telefon	Telephone.	Ydere	Outer.
Toldbod	Customhouse.	Yderst	Outermost.

WORDS AND PHRASES WHICH MAY BE FOUND OF USE IN QUESTIONING PILOTS.

Agter	Aft.	Lod	Lead.
Agterom	Astern of.	Löjtnant	Lieutenant.
Agterude	Astern.	Nathus	Binnacle.
Agter stevn	Stern.	Maskinmester	Engineer.
Baad	Boat.	Paa grund	Aground.
Babord	Port.	Pelling	Bearing.
Bakbord	Starboard.	Raa	Yard.
Bom	Boom or spar.	Raanok	Yardarm.
Bov	Bow.	Rat	Wheel.
Bugsere	Tow.	Ror	Rudder.
Dybgaaende	Draft of water.	Skorsten	Chimney, funnel.
Dyblod	Deep sea lead.	Skrog	Hull.
Forom	Ahead of.	Stag	Stay.
Forudde	Ahead.	Stevn	Stem.
Handlod	Handlead.	Styrbord	Starboard.
Hive Lodet	Heave the lead, to.	Styrepind	Tiller.
Kaptain	Captain.	Styrman	Mate.
Kompas	Compass.	Styrremme	Wheelropes.
Læland	Lee shore.	Tilvers	Aloft.
		Uderstyrman	Quartermaster.

ANCHORS, ANCHORING, CABLES, ETC.

Anker	Anchor.	Kabelaring	Messenger.
Anker böie	Anchor buoy.	Kjæde	Chain.
Ankerflig	Anchor flukes.	Klyds	Hawse (pipes).
Ankerstok	Anchorstock.	Korte ind	Shorten in.
Ankertoug	Cable.	Lette anker	Weigh anchor.
Bovanker	Bower anchor.	Löbe ud	Let go.
Drag	Grapnel.	Löse	To unmoor from pier or buoy.
Fortöie	To moor to a pier or buoy.	Pal	Pawl.
Gangspil	Capstan.	Stike	Veer.
Hive ind	Heave in.	Stop anker	Stream anchor.
Hive ind til kort stagsvis	Heave in to a short stay.	Uklar anker	Foul anchor.
Kabel	Cable.	Varp	Warp.
		Varp anker	Kedge anchor.

BUOYS.

Boje	Buoy.	Klokke tönde	Bellbuoy.
Fløjte tönde	Whistlebuoy.	Lys tönde	Lightbuoy.
Fortöjnings tönde	Mooring buoy.	Tönde	Buoy.

ENGINE ROOM ORDERS.

Fremad	Ahead.	Stop	Stop.
Fuld kraft	Full speed.	Tilbage	Astern.
Halv kraft	Half speed.		

MASTS.

Bram	Top gallant.	Mesen	Mizzen.
Fokke	Fore.	Overbram	Royal.
Maerse	Top.	Stor	Main.
Mast	Mast.		

MEASURES OF LENGTH.

Danish.	English.	Danish.	English.
Favn	Fathom.	Mil	Mile.
Fod	Foot.	Tomme	Inch.

SAILS.

Bjerge seil	Shorten sail.	Reb	Reef (of a sail).
Giv op	Clew up.	Rebe	To reef a sail.
Jager	Flying jib.	Seil	Sail.
Klyver	Jib.	Skod	Sheet of a sail.
Hals	Tack (of a sail).	Skodhorn	Clew of a sail.
Mesen seil	Spanker.		

TIDES, TIDAL STREAMS, ETC.

Ebb	Ebb.	Lav vand	Low water.
Faldende vand	Falling tide.	Stigende vand	Rising tide.
Flod	Flood.	Ström	Stream.
Hoi, Hoj, vand	High water.	Strömkobling	Tide race.

WINDS.

Byge	Squall.	Storm	Storm.
Kuling	Breeze.	Vind	Wind.

WORKING SHIP.

Faa bak i seilen	To be taken aback.	Mod vinden	To windward.
Fuld og by	Full and by.	Myslykka at stagvende	To miss stays.
Kovende	To wear ship.	Skjærpe	To brace up.
Lavere	To beat to windward.	Stagvende	To tack.
Lægge bi	To lie to.	Til læevart	To leeward.
Luff	Luff.		

SWEDISH TERMS.

Swedish.	English.	Swedish.	English.
Å	River.	Grund	Shoal.
Ångfartyg	Steam vessel.	Haf	Sea.
Ås	Ridge.	Hake	Hook (as of Holland) or hook pointed shoal.
Bäcke	Hill.		
Baek	Brook.	Halfö	Peninsula.
Båk	Beacon.	Hals	Neck.
Bank	Bank (shoal).	Hamn	Harbor.
Berg	Mountain.	Hög	High, or hill.
Borg	Fortified place.	Holm	Islet.
Bredning	Wide place in a river or channel.	Hufvud	Head.
		Inlopp	Entrance.
Bro	Bridge or pier.	Innerst	Innermost.
Bugt	Bend (in the coast).	Inre	Inner.
By	Town.	Insjö	Lake.
Dämning	Breakwater or mole.	Jernbana or Jernväg	Railway.
Djub	Deep.	Kaj	Quay.
Elf	River.	Kajdam	Pier.
Färja	Ferry.	Kalf	Calf.
Farlede	Channel.	Karantän	Quarantine.
Farvatten	Channel.	Klint	Summit or brow of a steep hill or cliff.
Flod	River.		
Fyr	Light.	Klippa	Cliff or rock.
Fyrhus	Lighthouse.	Krigsskepp	War vessel.
Fyrskepp	Lightvessel.	Kulle	Sandhill.
Fyrtaarn	Light-tower.	Kust	Coast.
Gammel	Old.	Kustvakt	Coastguard.
Gap	Opening.	Kyrka	Church.
Gård	Farm, sometimes country house.	Lilla	Little.
		Lopp	Channel.

SWEDISH TERMS—Continued.

Swedish.	English.	Swedish.	English.
Lots	Pilot.	Sjökart	Chart.
Lund	Grove.	Skans	Fort.
Lusthus	Summerhouse.	Skär	Rock above water.
Märke	Mark.	Skärgård	Fringing rocks, islets, and shoals.
Medterst	Central.		
Mellan	Between.	Skog	Wood.
Misvisande	Magnetic.	Skrent	Slope, bluff.
Misvisning	Variation (compass).	Slott	Castle.
Möl	Mill.	Söder	South.
Mun, Nynning	Mouth.	Södre, or Södlig	Southern.
		Spets	Point.
Näbb	Beak.	Stad	Town.
Nake	Nape (of the neck).	Stång	Pole.
Näs	Cape, point.	Sten	Stone.
Näsa or Nos	Nose.	Stor	Great.
Norr	North.	Sund	Sound.
Norra	Northern.	Svans	Tail.
Ny	New.	Tång	Seawrack.
Ö	Island.	Telefon	Telephone.
Öra	Ear.	Tjocka	Fog.
Öster	East.	Tjockskog	Thicket.
Östre	Eastern.	Tunga	Tongue.
Östra	Oyster.	Tullbevakning	Customs service.
Plat	Flat.	Tullkammare	Customhouse.
Radiotelegraf	Wireless telegraph.	Udde	Cape, point.
Räddnings station	Life-saving station.	Vagbrytare	Breakwater.
Raket	Rocket.	Vagel	Perch.
Ränna	Channel.	Vall	Steep coast.
Rätvisande	True.	Vest, Väster	West.
Redd	Roadstead.	Vestre, Västra	Western.
Ref	Reef.	Vik	Creek, bay.
Sand	Sand.	Vräka	Wreck.
Segelfartyg	Sailing vessel.	Yttre	Outer.
Sjö	Sea or lake.	Ytterst	Outermost.
Sjögras	Seaweed.		

WORDS AND PHRASES WHICH MAY BE FOUND OF USE IN QUESTIONING PILOTS.

Akter	Aft.	Löjtnant	Lieutenant.
Akterom	Astern of.	Maskinist	Engineer.
Akterstam	Stern.	Nackterhus	Binnacle.
Akterut	Astern.	På ground	Aground.
Baboard	Port.	Peiling	Bearing.
Backslag	Sternboard.	Rå	Yard.
Båt	Boat.	Rånock	Yardarm.
Bog	Bow.	Ratt	Wheel.
Bom	Boom or spar.	Roder	Rudder.
Bugsare	Tow.	Skorsten	Chimney, funnel.
Djubgående	Draft of water.	Skrof	Hull.
Djublod	Deep sea lead.	Stam	Stem.
Forom	Ahead of.	Stag	Stay.
Forut	Ahead.	Styrbord	Starboard.
Handlod	Handlead.	Styrepind	Tiller.
Kapten	Captain.	Styrman	Mate.
Kompass	Compass.	Styrrep	Wheel ropes.
Lägevall	Lee shore.	Till väders	Aloft.
Lod	Lead.	Undenstyrman	Quartermaster.
Loda	To have the lead.		

ANCHORS, ANCHORING, CABLES, ETC.

Ankar	Anchor.	Kedja	Chain.
Ankar boj	Anchor buoy.	Klys	Hawse (pipe).
Ankar flig	Anchor flukes.	Korta in	Shorten in.
Ankarstok	Anchor stock.	Loppa ut	Let go.
Ankartag	Cable.	Lösa	To unmoor from pier or buoy.
Bogankar	Bower anchor.		
Drag	Grapnel.	Lyfta ankar	Weigh anchor.
Förtöja	To moor to a pier or buoy.	Pall	Pawl.
Gängspel	Capstan.	Sticka	Veer.
Hyfra	Heave in.	Strom ankar	Stream anchor.
Hyfra till kort stagsvis	Heave in to short stay.	Oklar ankar	Foul anchor.
Kabele	Cable.	Warp	Warp.
Kabellarium	Messenger.	Warp ankar	Kedge anchor.

BUOYS.

Swedish.	English.	Swedish.	English.
Boj	Buoy.	Klokka tunna	Bellbuoy.
Flöjta tunna	Whistlebuoy.	Lyus tunna	Lightbuoy.
Förtöjnings tunna	Mooring buoy.	Tunna	Buoy.

ENGINE-ROOM ORDERS.

Framåt	Ahead.	Stop	Stop.
Fulla kraft	Full speed.	Tillbaka	Astern.
Half kraft	Half speed.		

MASTS.

Bram	Topgallant.	Mesan	Mizzen.
Focke	Fore.	Ofverbram	Royal.
Märse	Top.	Stor	Main.
Mast	Mast.		

MEASURES OF LENGTH.

Famn	Fathom.	Mil	Mile.
Fot	Foot.	Tum	Inch.

SAILS.

Giga	Clew up.	Ref	Reef (of a sail).
Halsa	Tack (of a sail).	Refva	To reef a sail.
Jagare	Flying jib.	Segel	Sail.
Klysvare	Jib.	Skot	Sheet (of a sail).
Mesan segel	Spanker.	Skothorn	Clew (of a sail).
Minska segel	Shorten sail.	Tillfata segel	To make sail.

TIDES, TIDAL STREAMS, ETC.

Ebb	Ebb tide.	Låga vatten	Low water.
Fallande vatten	Falling tide.	Stigande vatten	Rising tide.
Flod	Flood tide	Ström	Stream.
Hogt vatten	High water.	Strömsättning	Tide race.

WINDS.

By	Squall.	Storm	Storm.
Kultje	Breeze.	Vind	Wind.

WORKING SHIP.

Bidevind och fullt	Full and by.	Misslyckas at stagvända	To miss stays.
Brassa hårdt i vinden	To brace up.	Mot vinten	To windward.
Fa back i seglen	To be taken aback.	Stagvända	To back.
Lägge bi	To lie to.	Till lävart	To leeward.
Lofwere	To beat to windward.	Vända fordevind	To wear ship.
Lova	Luff.		

Pronunciation, etc.

Danish.	Swedish.	Pronunciation.
a	a	as a in clan, pan, etc.
aa	å	as a in fall.
æ	ä	as a in fate.
e	e	as e in they.
i	i	as ee in feel.
o	o	as o in lock.
ö	ö	as œu in cœur (French).
u	u	as oo in spoon.
y	u	as u in flute.

The consonants are pronounced similarly to consonants in English, except that d is pronounced like th in the, unless it is the first letter of the word, when it is pronounced similarly to d in English.

Examples showing the regular methods of adding articles, adjectives, etc., and of forming plurals.

Hus.....House.	Ö.....Island.
Et hus.....A house.	Öen.....The island.
Huset.....The house.	En ö.....An Island.
Huse.....Houses.	Öer.....Islands.
Husene.....The houses.	Öerne.....The islands.
Et stort hus.....A big house.	En stort ö.....A large island.
Det store hus.....The big house.	Den store ö.....The large island.
Store huse.....Big houses.	Store öer.....Large islands.
De store huse.....The big houses.	De store öer.....The large islands.

No rule can be given as to whether a noun takes en or et; this depends on the gender, and many are irregular.

INFORMATION RELATING TO NAVIGATIONAL AIDS AND GENERAL NAVIGATION.

THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

The following publications are issued by the United States Hydrographic Office as guides to navigation: Charts, Chart Catalogues, Sailing Directions, Light Lists, Notices to Mariners, Pilot Charts, and Hydrographic Bulletins. Of these, the Notices to Mariners and the Hydrographic Bulletins are free to mariners and others interested in shipping. The Pilot Charts are free to contributors of professional information, but are sold to the general public at 10 cents a copy. The other publications of the office are sold under the law at cost price.

The Charts, the Sailing Directions, and the Light Lists are all affected by continual changes and alterations, concerning which information from all parts of the world is published weekly in the Notices to Mariners.

The charts are always corrected for all available information up to the date of issue stamped upon them; and the Light Lists should be noted for the recent alterations and additions. The Sailing Directions, however, can not, from their nature, be so fully corrected, and in all cases where they differ from the charts, the charts must be taken as the guide.

Charts.—When issued from the Hydrographic Office, the charts have received all necessary corrections to date.

All small but important corrections that can be made by hand are given in the Notices to Mariners, and should at once be placed on the charts to which they refer.

Extensive corrections that can not be conveniently thus made are put upon the plates, and new copies are put on sale. Masters of vessels are urged to replace the old charts, which should be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which extensive corrections are made are noted on the chart on the right of the middle of the lower edge; those of the smaller corrections at the left lower corners.

The edition, and corresponding date, of the chart will be found in the right lower corner, outside the outer neat line.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (found in the lower right and upper left corners), in order that the edition of the chart referred to may be known.

The Light Lists are corrected before issue, and all changes are published in the weekly Notices to Mariners.

The navigating officer should make notations in the tabular form in the Light Lists and paste in at the appropriate places slips from the Notices to Mariners.

The Light Lists should always be consulted as to the details of a light, as the description in the sailing directions is not complete, and may be obsolete, in consequence of changes since publication.

The Sailing Directions or Pilots are kept corrected by addenda; and subsequent to date of last addenda, they should be kept corrected by means of the Notices to Mariners. Sailing Directions issued to naval vessels carry with them an envelope containing slips of corrections up to date of issue.

Addenda are published from time to time, and contain a summary of all the information received up to date since the publication of the volume to which they refer, canceling all previous Notices to Mariners.

To enable the books to be more conveniently corrected, addenda and Notices to Mariners are printed on one side only, and two copies of the latter are issued to each naval vessel, one to be cut and the slips pasted in at the appropriate places, the other to be retained intact for reference.

To paste in the slips, as the Notices to Mariners are received, is one of the duties of the navigating officer, demanding faithful attention.

It must, however, be understood that Sailing Directions will rarely be correct in all details, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide, for which purpose, for ordinary navigation, it is sufficient.

The Tide Tables, which are published annually by the United States Coast and Geodetic Survey, give the predicted times and heights of the high and the low waters for every day in the year at 70 of the principal ports of the world, and, through the medium of these by means of tidal differences and ratios, at a very large number of subordinate ports. The tables for the Atlantic and the Pacific coast ports of the United States are also published separately.

It should be remembered that these tables aim to give the times of high and low water, and not the times of turning of the current or of slack water, which may be quite different.

Notices to Mariners, containing fresh information pertaining to all parts of the world, are published weekly and mailed to all

United States ships in commission, Branch Hydrographic offices and agencies, and United States consulates. Copies are furnished free by the main office or by any of the branch offices on application.

With each Notice to naval vessels is sent also a separate sheet, giving the items relating to lights contained in the latest Notice, intended especially for use in correcting the Light Lists.

Pilot Charts of the North Atlantic, Central American Waters, and North Pacific and Indian Oceans are published each month, and of the South Atlantic and South Pacific Oceans each quarter. These charts give the average conditions of wind and weather, barometer, percentage of fog and gales, routes for steam and sailing vessels for the period of issue, ice and derelicts for the preceding period, ocean currents and magnetic variation for the current year, storm tracks for preceding years, and much other useful information. They are furnished free only in exchange for marine data or observations.

Hydrographic Bulletins, published weekly, are supplemental to the Pilot Charts, and contain the latest reports of obstructions and dangers along the coast and principal ocean routes, ice, derelicts, and wreckage, reports of the use of oil to calm the sea, and other information for mariners. They are to be had free upon application.

THE USE OF CHARTS.

Accuracy of chart.—The value of a chart must manifestly depend upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become.

To judge of a survey, its source and date, which are generally given in the title, are a good guide. Besides the changes that may have taken place since the date of the survey, in waters where sand or mud prevails, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail; until a chart founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbors and their approaches, no surveys yet made have been so thorough as to make it certain that all dangers have been found. The number of the soundings is another method of estimating the completeness of the survey, remembering, however, that the chart is not expected to show all the soundings that were obtained. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Large or irregular blank spaces among soundings mean that no soundings were obtained in these spots. When the surrounding soundings are deep it may fairly be assumed that in the blanks the water is also deep; but when they are shallow, or it can be

seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch or pinnacle rock.

A wide berth should therefore be given to every rocky shore or patch, and instead of considering a coast to be clear. the contrary should be assumed.

Fathom curves a caution.—Except in charts of harbors that have been surveyed in detail, the 5-fathom curve on most charts may be considered as a danger line or caution against unnecessarily approaching the shore or bank within that line, on account of the possible existence of undiscovered inequalities of the bottom, which only an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for so detailed a survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The 10-fathom curve on rocky shores is another warning, especially for ships of heavy draft.

A useful danger curve will be obtained by tracing out with a colored pencil, or ink, the line of depth next greater than the draft of the ship using the chart. For vessels drawing less than 18 feet the edge of the sanding serves as a well-marked danger line.

Charts on which no fathom curves are marked must especially be regarded with caution, as indicating that soundings were too scanty and the bottom too uneven to enable the curves to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed around, as it is doubtful how closely the spot may have been examined and whether the least depth has been found.

The chart on largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it.

Caution in using small-scale charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on one of small scale the same amount of displacement means a large fraction of a mile.

Distortion of printed charts.—The paper on which charts are printed from engraved plates has to be damped. On drying distortion takes place from the inequalities of the paper, which greatly

varies with different papers and the amount of the damping; but it does not affect navigation. The larger the chart the greater the amount of this distortion. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted on the chart, especially if the lines to objects be long.

Mercator chart.—Observed bearings are not identical with those measured on the Mercator chart (excepting only the bearings north and south, and east and west on the equator) because the line of sight, except as affected by refraction, is a straight line and lies in the plane of the great circle, while the straight line on the chart (except the meridian line) represents, not the arc of a great circle, but the loxodromic curve, or rhumb line, which on the globe is a spiral approaching but never in theory reaching the pole, or, if the direction be east and west, a circle of latitude.

The difference is not appreciable with near objects, and in ordinary navigation may be neglected. But in high latitudes, when the objects are very distant and especially when lying near east or west, the bearings must be corrected for the convergence of the meridians in order to be accurately placed on the Mercator chart, which represents the meridians as parallel.

On the polyconic chart, since a straight line represents (within the limits of 15 or 20 degrees of longitude) the arc of a great circle or the shortest distance between two points, bearings of the chart are identical with observed bearings.

The mercator projection is unsuited to surveying, for which purpose the polyconic projection is used by the Hydrographic Office and the Coast and Geodetic Survey.

Notes on charts should always be read with care, as they may give important information that can not be graphically represented.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact positions. They should therefore be regarded as warnings, and not as infallible navigational marks, especially when in exposed places and in the wintertime; and a ship's position should always, when possible, be checked by bearings or angles of fixed objects on shore.

Gas buoys.—The lights shown by gas buoys can not be implicitly relied on; the light may be altogether extinguished, or, if periodic, the apparatus may get out of order.

Whistle and bell buoys are sounded only by the action of the sea; therefore, in calm weather, they are less effective or may not sound.

Lights.—All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of 15 feet for the observer's eye. The effect of a greater or less height

of eye can be ascertained by means of the table of distances of visibility due to height, published in the Light Lists.

The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Refraction, too, may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light, the fact may be forgotten that aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be obtained from the standard compass when you lay down from aloft.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the ship is on the circle of visibility corresponding with the usual height of the eye, or unexpectedly nearer the light.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by its candlepower or order, as stated in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range corresponding to its height. Thus, a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the influence of the wind large areas of silence have been found in different directions and at different distances from the origin of sound, even in clear weather; therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly toward the land, and may not be observed by the lighthouse keepers until upon them; a ship may have been for many hours in it, and approaching the land in confidence, depending on the signal, which is not sounded. When sound travels against the wind, it may be thrown upward; a man aloft might then hear it though inaudible on deck.

The submarine bell system of fog signals is much more reliable than systems transmitting sound through the air, as sound traveling in water is not subject to the same disturbing influences; the fallibility of the lighthouse keeper is, however, about the same in all systems, so that caution should be observed even by vessels equipped with submarine-bell receiving apparatus.

Submarine bells have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus may determine the approximate bearing of the signal. These signals may be heard also on vessels not equipped with receiving apparatus by observers below the water line, but the bearing of the signal can not then be readily determined.

Vessels equipped with radio apparatus and submarine bell receivers may fix their distance from a light vessel having radio and submarine bell, utilizing the difference in velocity of sound waves of the radio and the bell. Sound travels 4,794 feet per second at 66° F. in water, and the travel of radio sound waves for practicable distances may be taken as instantaneous.

All vessels should observe the utmost caution in closing the land in fogs. The lead is the safest guide and should be faithfully used.

Tides.—A knowledge of the times of high and low water and of the amount of vertical rise and fall of the tide is of great importance in the case of vessels entering or leaving port, especially when the low water is less than or near their draft. Such knowledge is also useful at times to vessels running close along a coast, in enabling them to anticipate the effect of the tidal currents in setting them on or offshore. This is especially important in fog or thick weather.

The predicted times and heights of the high and low waters, or differences by which they may be readily obtained, are given in the Tide Tables for all the important ports of the world. The height at any intermediate time may be obtained by means of Tables 2A and 2B for most of the principal tidal stations of the United States, given in Table 1, and for the subordinate stations of Table 3 by using them as directed in the Tide Tables. The intermediate height may also be obtained by plotting the predicted times and heights of high and low water and connecting the points by a curve. Such knowledge is often useful in crossing a bar or shallow flats.

Planes of reference.[1]—The plane of reference for soundings on Hydrographic Office charts made from United States Government surveys and on Coast and Geodetic Survey charts of the Atlantic coast of the United States is mean low water; on the Pacific coast of the United States as far as the Strait of Juan Fuca, it is the mean of the lower low waters; and from Puget Sound to Alaska, the plane employed on Hydrographic Office charts is low water ordinary springs.

On most of the British Admiralty charts the plane of reference is the low water of ordinary springs; on French charts, the low water of equinoctial springs.

[1] The distinction between "rise" and "range" of the tide should be understood. The former expression refers to the height attained above the datum plane for soundings, differing with the different planes of reference; the latter, to the difference of level between successive high and low waters.

In the case of many charts compiled from old or various sources the plane of reference may be in doubt. In such cases, or when ever not stated on the chart, the assumption that the reference plane is low water ordinary springs gives a larger margin of safety than mean low water.

Whichever plane of reference may be used for a chart it must be remembered that there are times when the tide falls below it. Low water is lower than mean low water about half the time, and when a new or full moon occurs at perigee the low water is lower than the average low water of springs. At the equinoxes the spring range is also increased on the coasts of Europe, but in some other parts of the world, and especially in the Tropics, such periodic low tides may coincide more frequently with the solstices.

Wind or a high barometer may at times cause the water to fall below even a very low plane of reference.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can not be depended upon and additional caution is necessary.

Mean sea level.—The important fact should be remembered that the depths at half tide are practically the same for all tides, whether neaps or springs. Half tide therefore corresponds with mean sea level. This makes a very exact plane of reference, easily found, to which it would be well to refer all high and low waters.

The Tide Tables give in Table 3, for all the ports, the plane of reference to which tidal heights are referred and its distance below mean sea level.

If called on to take special soundings for the chart at a place where there is no tidal bench mark, mean sea level should be found and the plane for reductions established at the proper distance below it, as ascertained by the Tide Tables, or by observations, or in some cases, if the time be short, by estimation, the data used being made a part of the record.

Tidal streams.—In navigating coasts where the tidal range is considerable, especial caution is necessary. It should be remembered that there are indrafts to all bays and bights, although the general run of the stream may be parallel with the shore.

The turn of the tidal stream offshore is seldom coincident with the times of high and low water on the shore. In some channels the tidal stream may overrun the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

The effect of the tidal wave in causing currents may be illustrated by two simple cases.

(1) Where there is a small tidal basin connected with the sea by a large opening.

(2) Where there is a large tidal basin connected with the sea by a small opening.

In the first case the velocity of the current in the opening will have its maximum value when the height of the tide within is changing most rapidly, i. e., at a time about midway between high and low water. The water in the basin keeps at approximately the same level as the water outside. The flood stream corresponds with the rising and the ebb with the falling of the tide.

In the second case the velocity of the current in the opening will have its maximum value when it is high water or low water without, for then there is the greatest head of water for producing motion. The flood stream begins about three hours after low water, and the ebb stream about three hours after high water, slack water thus occurring about midway between the tides.

Along most shores not much affected by bays, tidal rivers, etc., the current usually turns soon after high water and low water.

The swiftest current in straight portions of tidal rivers is usually in the middle of the stream, but in curved portions the most rapid current is toward the outer edge of the curve, and here the water will be deepest. The pilot rule for best water is to follow the ebb tide reaches.

Countercurrents and eddies may occur near the shores of straits, especially in bights and near points. A knowledge of them is useful in order that they may be taken advantage of or avoided.

A swift current often occurs in a narrow passage connecting two large bodies of water, owing to their considerable difference of level at the same instant. The several passages between Vineyard Sound and Buzzards Bay are cases in point. In the Woods Hole passage the maximum strength of the tidal streams is at about half tide.

Tide rips are made by a rapid current setting over an irregular bottom, as at the edges of banks where the change of depth is considerable.

Current arrows on charts show only the most usual or the mean direction of a tidal stream or current; it must not be assumed that the direction of a stream will not vary from that indicated by the arrow. The rate, also, of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

FIXING POSITION.

Sextant method.—The most accurate method available to the navigator of fixing a position relative to the shore is by plotting with a protractor, sextant angles between three well-defined objects on

shore which are shown on the chart; this method, based on the "three-point problem" of geometry, should be in general use.

For its successful employment it is necessary: First, that the objects be well chosen; and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice. Two observers are better for this method.

Near objects should be used either for bearings or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn.

On the other hand distant objects should be used for direction, because less affected by a small error or change of position.

The three-arm protractor or station pointer consists of a graduated brass circle with one fixed and two movable radial arms, the three beveled edges of the arms, if produced, intersecting at the exact center of the instrument. The edge of the fixed arm marks the zero of the graduation which enables the movable arms to be set at any angles with the fixed arm.

To plot a position, the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole.

The transparent xylonite protractor is an excellent substitute for the brass instrument and in some cases preferable to it, as when, for instance, the objects angled on are so near the observer that they are more or less hidden by the circle of the instrument. The xylonite protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through three objects (in which case the sum of the observed angles equals the supplement of the angle at the middle object made by lines from the other two) it will be indeterminate, as it will plot all around the circle. Such an observation is called a "revolver." An approach to this condition must be avoided. Near objects are better than distant ones, and, in general, up to 90° the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for

navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation.

A single angle and a range of two objects give in general an excellent fix, easily obtained and plotted.

Advantages of sextant method.—In many narrow waters where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore.

In all cases where great accuracy of position is desired, such as the fixing of a rock or shoal, or of fresh soundings or new buildings as additions to the chart, the sextant should invariably be used. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. If a round of angles can be taken the observer's accuracy is also checked. In the case of ordinary soundings a third angle need be taken only occasionally; first, to check the general accuracy of the chart, as above stated; second, to make certain that the more important soundings, as at the end of a line, are correctly placed.

If communication can be had with the shore, positions may be fixed with great accuracy by occupying with theodolite or sextant two known points of the chart. The third angle of the triangle, that between the two points at the position sought, should be measured as a check.

The compass.—It is not intended that the use of the compass to fix the ship should be given up; in ordinary piloting the compass, with its companion, the pelorus, may be usefully employed for this purpose, although less accurate than the sextant.

If the accuracy of the chart is doubtful, the compass should be used in preference to the sextant.

In fixing by the compass, it should always be remembered that a position by two bearings only, like that by two angles only, is liable to error. An error may be made in taking a bearing, or in applying to it the deviation, or in laying it on the chart. A third or check bearing should, therefore, be taken of some other object, especially when near the shore or dangers. A common intersection for the three lines assures accuracy.

When the three lines do not intersect in a point, the following rule holds: If the line drawn to the middle object falls to the right of the point of intersection of the lines to the two outside objects, the position of the observer was to the right of the line to the middle object; and if it falls to the left of the intersection his position was to the left of the line. Thus it will be seen that the assumption, that the position is at the center of the triangle formed by the intersecting lines, is incorrect.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "bow and beam bearing," the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy, and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam before the position is obtained.

By taking the bearings at two points and four points on the bow, a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current. Taking afterwards the beam bearing gives, with slight additional trouble, the distance of the object when abeam; such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in cases of being suddenly shut in by fog.

When the first bearing is 26½° from ahead, and the second 45°, the run between bearings will equal the distance at which the object will be passed abeam.

A table of multipliers of the distance run in the interval between any two bearings of an object, the product being its distance at the time of the second bearing, is given in the Light Lists and in Bowditch.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, caution is necessary, as should the chart be inaccurate, i. e., should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

The vertical danger angle may be conveniently used when passing elevated points of known heights, such as lighthouses, cliffs, etc. The computation of the distance corresponding to the height of the object and its angular elevation requires for small distances merely the solution of a plain right triangle; the natural cotangent of the angle multiplied by the height in feet gives the distance in

feet. The convenient use of this method, however, requires tables such as those published by Capt. Lecky in his little book entitled "The Danger Angle and Offshore Distance Tables." This book very usefully extends the vertical angle method to finding a ship's position at sea by observing the angular altitude of a peak of known height and its bearing. The tables give heights up to 18,000 feet and distances up to 110 miles.

When the angles are not too large they should be observed "on and off the limb" and the index error of the sextant thus eliminated, in preference to correcting for it the single altitude. It must be remembered that in high latitudes the bearing of a distant object needs correction for the convergence of the meridians before being laid down on a Mercator chart. The correction may be found by the following formula, using the approximate position: The sine of the correction equals the product of the sine of half the difference of longitude by the sine of the middle latitude. It is applied on the equatorial side of the observed bearing and its effect is always to increase the latitude of the observer.

Soundings taken at random are of little value in fixing or checking position and may at times be misleading. In thick weather, when near or closing the land, soundings should be taken continuously and at regular intervals, and, with the character of the bottom, systematically recorded. By laying the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship, and then moving the paper over the chart, keeping the line representing the track parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined. This plan was suggested by Lord Kelvin, whose admirable sounding machine renders the operation of sounding possible in quite deep water, without slowing down the ship and consequent loss of time.

Pelorus.—All ships should be supplied with the means of taking accurate bearings both by night and by day. The standard compass is not always conveniently placed for the purpose; in such case a pelorus will be very useful, but the results are not as accurate as those obtained direct from the compass. The utility of such an instrument in ascertaining the change of bearing of an approaching ship should not be overlooked.

Position lines.—Among the various methods of fixing position at sea, the one which should be best understood and put to the most constant use is that employing position or Sumner lines. These lines give the most comprehensive information to the navigator with the least expenditure of labor and time. The knowledge gained is that the vessel must be somewhere on the line, provided the data used is accurate and the chronometer correct. As the information

given by one line of position is not sufficient to determine the definite location of the vessel, it is necessary to cross this line by another similarly obtained, and the vessel being somewhere on both must be at their intersection. However, a single line, at times, will furnish the mariner with invaluable information; for instance, if it is directed toward the coast, it marks the bearing of a definite point on the shore, or if parallel to the coast it clearly indicates the distance off, and so will often be found useful as a course. A sounding taken at the same time with the observation will in certain conditions prove of great value in giving an approximate position on the line.

The easiest and quickest way to establish a line of position is by employing the method of Marcq St. Hilaire, as modified by the use of tables of altitude. The principle of this method is one of altitude differences, in which the observed altitude is compared with the computed altitude for a dead reckoning, or other selected position, and the difference in minutes of latitude measured toward the body along the line of its azimuth, if the observed altitude is greater than the computed altitude, and vice versa. A line drawn at right angles to the line of azimuth through the point thus determined is the position line, somewhere upon which will be found the position of the vessel. The tables of altitude obviate the computation of the altitude and thereby greatly facilitate the establishment of the line.

A position line may also be found by computing two positions for longitude with two assumed latitudes, and drawing the line between them; or by drawing to the position obtained with one latitude a line at right angles to the bearing of the body as taken from the azimuth tables.

A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The position lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day and in combination with the sun gives an excellent fix.

The morning and evening twilight observations, besides their great accuracy, possess the additional advantage of greatly extending the ship's reliable reckoning beyond the limits of the ordinary day navigation, and correspondingly restricting the dead reckoning uncertainties of the night. An early morning fix in particular is often of great value. Though the same degree of

accuracy as at twilight can not be expected, night observations are very valuable and should be assiduously practiced.

Piloting.—The navigator, in making his plan for entering a strange port, should give very careful previous study to the chart and sailing directions, and should select what appear to be the most suitable marks for use, also providing himself with substitutes to use in case those selected as most suitable should prove unreliable in not being recognized with absolute certainty. Channel buoys seen from a distance are difficult to identify, because their color is sometimes not easily distinguished and they may appear equally distant from the observer even though they be at widely varying distances. Ranges should be noted, if possible, and the lines drawn, both for leading through the best water in channels, and also for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down where no suitable ranges appear to offer. The courses to be steered in entering should also be laid down and distances marked thereon. If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circles should be plotted and regular courses planned, rather than to run haphazard by the indications of the angle alone, with the possible trouble from bad steering at critical points.

The ship's position should not be allowed to be in doubt at any time, even in entering ports considered safe and easy of access, and should be constantly checked, continuing to use for this purpose those marks concerning which there can be no doubt until others are unmistakably identified.

The ship should ordinarily steer exact courses and follow an exact line, as planned from the chart, changing course at precise points, and, where the distances are considerable, her position on the line should be checked at frequent intervals. This is desirable even where it may seem unnecessary for safety, because if running by the eye alone and the ship's exact position be immediately required, as in a sudden fog or squall, fixing at that particular moment may be attended with difficulty.

The habit of running exact courses with precise changes of course will be found most useful when it is desired to enter port or pass through inclosed waters during fog by means of the buoys; here safety demands that the buoys be made successively, to do which requires, if the fog be dense, very accurate courses and careful attention to the times, the speed of the ship, and the set of the current; failure to make a buoy as expected leaves, as a rule, no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

In passing between dangers where there are no suitable leading marks, as, for instance, between two islands or an island and the main shore, with dangers extending from both, a mid-channel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely the direction midway between visible objects.

In piloting among coral reefs or banks, a time should be chosen when the sun will be astern, conning the vessel from aloft or from an elevated position forward. The line of demarcation between the deep water and the edges of the shoals, which generally show as green patches, is indicated with surprising clearness. This method is of frequent application in the numerous passages of the Florida Keys.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the helm to be put over and then steadying when on the desired heading, with the possibility of the attention being diverted and so of forgetting in the meantime, as may happen, that the ship is still swinging. The helmsman, knowing just what is desired and the amount of the change to be made, is thus enabled to act more intelligently and to avoid bad steering, which in narrow channels is a very positive source of danger.

Coast piloting involves the same principles and requires that the ship's position be continuously determined or checked as the landmarks are passed. On well-surveyed coasts there is a great advantage in keeping near the land, thus holding on to the marks and the soundings, and thereby knowing at all times the position, rather than keeping offshore and losing the marks, with the necessity of again making the land from vague positions, and perhaps the added inconvenience of fog or bad weather, involving a serious loss of time and fuel.

The route should be planned for normal conditions of weather, with suitable variations where necessary in case of fog or bad weather or making points at night, the courses and distances, in case of regular runs over the same route, being entered in a notebook for ready reference, as well as laid down on the chart. The danger circles for either the horizontal or the vertical danger angles should be plotted, wherever the method can be usefully employed, and the angles marked thereon; many a mile may thus be saved in rounding dangerous points with no sacrifice in safety. Ranges should also be marked in, where useful for position or for safety, and also to use in checking the deviation of the compass by comparing, in crossing, the compass bearing of the range with its magnetic bearing, as given by the chart.

Changes of course will in general be made with mark or object abeam, the position (a new "departure") being then, as a rule, best and most easily obtained. The pelorus should be at all times in readiness for use, and the chart where it may be readily consulted by the officer of the watch. The sextant should also be kept conveniently at hand.

A continuous record of the progress of the ship should be kept by the officer of the watch, the time and patent-log reading of all changes of course and of all bearings, especially the two and four point bearings, with distance of object when abeam, being noted in a book kept in the pilot house for this especial purpose. The ship's reckoning is thus continuously cared for as a matter of routine and without the presence or particular order of the captain or navigating officer. The value of thus keeping the reckoning always fresh and exact will be especially appreciated in cases of sudden fog or when making points at night.

Where the coastwise trip must be made against a strong head wind, it is desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse current that prevail farther out. In some cases, with small ships, a passage can be made only in this way. The important saving of coal and of time, which is even more precious, thus effected by skillful coast piloting makes this subject one of prime importance to the navigator.

Change in the variation of the compass.[1]—The gradual change in the variation must not be forgotten in laying down on the chart courses and bearings. The magnetic compasses placed on the charts for the purpose of facilitating the plotting become in time slightly in error, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of this change may be of importance. The date of the variation and the annual change, as given on the compass rose, facilitate corrections when the change has been considerable. The compasses are reengraved once in ten years; more frequent alterations on one spot in a copperplate would not be practicable.

The change in the variation is in some parts of the world so rapid as to need careful consideration, requiring a frequent change of the course. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles.

Local magnetic disturbance of the compass on board ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the

[1] See H. O. Chart No. 2406, Variation of the Compass.

ship. Observation shows that disturbance of the compass in a ship afloat is experienced in only a few places on the globe.

Magnetic laws do not permit of the supposition that the visible land causes such disturbance, because the effect of a magnetic force diminishes so rapidly with distance that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot; but the area of disturbance will be small unless there are many centers near together.

Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skillfully applied, may prevent much damage both to ships, especially of the smaller classes, and to boats by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:

1. On free waves, i. e., waves in deep water, the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when no other oil is obtainable, or it may be mixed with other oils; all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. In cold water, the oil, being thickened by the low temperature and not being able to spread freely, will have its effect much reduced; a rapid-spreading oil should be used.

5. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

6. It is useful in a ship or boat either when running, or lying-to, or in wearing.

7. When lowering and hoisting boats in a heavy sea the use of oil has been found greatly to facilitate the operation.

8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to permit leakage. The waste pipes forward are also very useful for this purpose.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan.

On a bar, with the ebb tide running, it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside, bearing in mind that her natural tendency is always to forge ahead. If she is aground the effect of oil will depend upon attending circumstances.

11. For a boat riding in bad weather to a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat, and the bag readily hauled on board for refilling, if necessary.

SCANDINAVIA PILOT.

VOLUME II.

CHAPTER I.

GENERAL REMARKS — SOUNDINGS — FISHERY — SWEDEN — DENMARK — SCHLESWIG-HOLSTEIN—WINDS AND WEATHER—STORM SIGNALS—WIND SIGNALS—CURRENTS—ICE—ICE SIGNALS—LIGHT-VESSEL SIGNALS—ICE BREAKERS—BUOYAGE—PILOTS—LIGHTS—LIGHT VESSELS—SIGNAL STATIONS—SUBMARINE TELEGRAPH CABLES—WIRELESS TELEGRAPH—GERMAN DEPTH SIGNALS—DISTRESS SIGNALS—LIFE-SAVING STATIONS—QUARANTINE—FOREIGN PORTS' REGULATIONS—GUN AND TORPEDO PRACTICE—TIME SIGNALS—NAVAL ESTABLISHMENTS—DOCKS—COAL—ROUTES TO THE BALTIC—DIRECTIONS.

General remarks.—Scandinavia Pilot, Volume II, embraces the area occupied by the Kattegat and the several channels leading from the Kattegat into the Baltic Sea; it ends at an imaginary line drawn from Falsterbo Point (the southwestern extreme of Sweden) to Cape Arkona on the opposite German coast.

The coasts of the whole area covered by the work consist of the east coast of Jutland on the west; the west coast of Sweden on the east; Schleswig-Holstein on part of the west and south sides, and Mecklenburg-Schwerin and Pomerania on the south side, while the large islands of Fyen and Zealand, and smaller ones surrounding them, which occupy the greater portion of the area in the south, form part of the Kingdom of Denmark.

Within its limits the navigation is somewhat intricate, as even the Kattegat, its northern and most open part, has dangerous shores on either side, with several islands, rocks, and shoals scattered in and about mid-channel.

The Kattegat has two channels through it, named, respectively, East and West Channels, these passing east and west of the islands and banks which occupy its center, and it communicates with the Baltic by three distinct channels, viz, the Sound on the eastern side, the Great (Store) Belt in the center, and the Little (Lille) Belt on the western side.

The Sound, passing between the Zealand Island and the Swedish coasts, is the shortest and most direct route, and at its southern end

is divided by Saltholm into Flint and Drogden Channels, both navigable, except for vessels of deep draft. The Great and Little Belts, on either side of Fyen, unite southward of that island and then communicate with the Baltic Sea through Fehmarn Belt and Cadet Channel.

The Great Belt is the most suitable channel for fleets and vessels of deep draft, although the Little Belt has a depth of 6 fathoms throughout its entire length.

Soundings.—In approaching the Kattegat through the Skagerrak, the depths are considerably less off the north coast of Jutland, the 100-fathoms contour line being about 23 miles northward of the Skaw, with depths of from 200 to 400 fathoms between it and the Norwegian coast; from the above position the 100-fathoms contour forms a small tongue of deep water for about 15 miles toward the entrance of the Kattegat, and then turns northward at about the same distance eastward of the Skärgård of the Swedish coast.

A line drawn from the Skaw to the entrance of Marstrand Fiord passes southward of all the deep water with the exception of the narrow strip of from 41 to 55 fathoms, known as Rännan Deep, which has a southerly direction parallel to the Swedish shore for a distance of about 25 miles, or to abreast Outer Tistlarne.

Westward of Rännan Deep is an area with depths between 20 and 30 fathoms, with tongues extending toward, and passing northward of, the Skaw, and toward the entrance to Læsö Channel to the southwestward; between the middle of this area and the Jutland coast, for about 25 miles, the depths are under 20 fathoms.

Southward of Læsö on the western side of the Kattegat the water becomes shoal, with general depths of from 5 to 10 fathoms, and numerous banks having less water over them; at the entrance to the Belts the water deepens to 13 and 18 fathoms in places.

Eastward of Rännan Deep and down the Swedish coast to about latitude 57° north the depths are generally between 25 and 35 fathoms, except where there are detached banks with less water. Southward of latitude 57° north the depths for about 15 miles off the Swedish coast are under 20 fathoms, and generally throughout the whole coast the depths are not too great for anchorage in the event of fog or emergency.

The bottom is generally of clean fine or coarse sand of a whitish-yellow color, other colors being rare but occasionally met with in spots so isolated that they may serve to a certain extent for guidance. Gravel is also found in places in the Kattegat, where, as a rule, it is of a distinctive reddish-brown color. Stones of various size and material are found scattered in all the different channels, but not in the deeper parts, where deposits of clay with an upper surface of soft mud have completely covered all the stones; this mud is usually of

a grayish-blue color and so soft in its upper strata that the lead sinks deeply into it, often requiring considerable force to withdraw it.

Over a large extent of the Kattegat, the bottom consists of a mixture of sand and mud with broken shells, and sometimes branches and fragments of a coral-like formation (probably alcyonaria), none of which, however, has ever been found containing living organisms. The same description of bottom stretches far into the Belts and between the larger islands, but gradually loses its gray character and becomes discolored by mixture with black mud. Where this occurs, as in most of the fiords, and on opening out into the Baltic toward Bornholm, the bottom brought up by the lead has a very offensive smell.

In some spots, especially near the coast and in the more land-locked localities, the grass-wrack (zostera) often grows in such abundance and thickness that it prevents the lead reaching the bottom. Another seaweed which is very common in Danish waters is the sea clover (laminaria), which, however, being only found in shallow water and always in connection with stones, is a sure indication of a stony bottom.

Argillaceous clay, or lime and chalk strata, are found in some parts of Lim Fiord in Jutland. In the steep portions of the coast and in the cliffs, these kinds of rock are not unfrequently present, as in the well-known cliffs of Moen and Stevens near Kjoge Bay; as also in the precipitous shore of the Little Belt. Granite rocks are only found in Bornholm, described in Baltic Pilot.

Caution.—Several instances having been reported of vessels grounding on fragments of rock, apparently at some time detached and lifted from the bottom by the action of ice or currents, and thus standing several feet above its mean level, as shown by soundings, it would appear to be advisable that vessels, and especially those of deep draft, should not be taken into depths that nearly approach, or are perhaps only slightly in excess of, the draft, unless absolutely necessary.

The localities mentioned where these detached rocks have been encountered are the Sound and belts, especially the Langelands Belt, and the Schleswig Holstein coast.

Fishery.—The mackerel fishery, the most important in the Kattegat, commences in the middle of May, with nets set a considerable distance out from the shore. Line fishing commences toward autumn. Herring fishery with drift nets is carried on in the vicinity of Fehmarn from August to the end of October.

Fishing vessels carry the prescribed lights, and always lie to leeward of their nets.

Sweden.—The southern portion of the west coast of the Swedish Peninsula, which forms the eastern side of the Kattegat, is only about

150 miles in length between the parallels of 55° 20′ north and 58° north.

This portion of Sweden appears to date back to about the eighth century, and at one time probably belonged to the Danes; but its early history is obscure. Both Swedish and Gothic territory were divided into numerous Provinces, and the election of the kings took place in the Province of upper Sweden. The first attempt to unite the Scandinavian kingdoms was made about the middle of the fourteenth century.

Although from a historical point of view Sweden is divided into 25 Provinces, from that of an administrative one it consists of 25 districts or lans, of which only 4 border the west coast, viz, from north to south, Göteborg (1,948 square miles), Halland (1,900 square miles), Kristianstad (2,486 square miles), and Malmöhus (1,866 square miles), the last being the most populous of all the districts. The population of these districts will be given hereafter.

Physical features.—Sweden is divided into the Highlands and Alpine District, the Central Lowlands, the Småland Highlands, and the plains of Skåne; and the western portion under notice may be said to belong to the three last, the first being the marine deposit district and the second the land lying above that level. The coastal region is generally low, the only elevations in this locality being Halleberg and Hunneberg, two isolated hills, each about 466 feet high, situated near the Göta Älf Valley.

Remarkable features in the surface contour are numerous ridges of gravel, known as eskers or kames, which traverse the country in a north-northwest and opposite direction, and are from 100 to 200 feet above the clay and sand plain. They are deposits of the Glacial epoch. The Skärgård, or numerous rocky islands which fringe the coast from the northward, entirely disappear about Varberg in latitude 57° 5′ north.

The rivers on this coast are small, the largest being Göta Älf, which is 56 miles in length and flows out of Lake Vänern, 86 miles long, 144 feet above the sea, 292 feet deep, and covering an area of 2,150 square miles; at Trollhättan, Göta Älf has a fall 105 feet high, which is utilized for driving machinery. Lakes Vänern and Vättern, the latter southeastward of the former, are the two largest lakes in Sweden; the other rivers on this coast are the Viskån, Äträn, Nissa Ån, and Laga Ån, all small salmon streams.

Geology.—The portion of the west coast considered in this work may be divided geologically into two parts, as from Marstrand, as far south as Engelholm, the whole, extending inland for half the breadth of the peninsula, is composed of gneiss and granite gneiss, while from the Kullen south to Skanör Peninsula it is Triassic, Rhæto-Liassic, and Cretaceous.

The slight elevations, already mentioned, belong to the Cambrian system and are in almost horizontal layers, the layer of sandstone overlying Archæan rocks, being surmounted by Silurian strata of slates and limestones. The islands of the Skärgård are the highest parts of land that once formed part of the mainland previous to the glacial period.

Flora and fauna.—As regards trees, Sweden may be divided into the Alpine, birch, fir, oak, and beech regions, and the whole of the west coast, from Göteborg south, belongs to the latter with a few alder bogs, while northward of Göteborg the beech is mixed with spruce. Large cultivated plains with beech wood, extensive heaths, and fields of drift sand are the principal features.

Beech woods, generally compact, have such plants as wood anemone and sorrel, oak fern, wavy hair grass; the heaths are marked by a dense growth of heather, interspersed with cow and crow berries, cross-leaved heath, sheep's fescue, etc., and boggy heaths have bog moss and sweet gale, while the blown sand fields have a belt of downs, with lymegrass and maram. The flora of the whole country includes 1,600 species of wild flowering plants.

In this part of Sweden foxes, badgers, common hedgehogs, and roe deer are the principal mammals, and the birds are the common partridge (numerous, and introduced in 1500), the kestrel, the hobby, the skylark, long-eared tawny, or brown owls, and the greed woodpecker, the goldfinch, the linnet, the stock and ring dove, landrail, wild duck, crested grebe, etc.

There are about 40 salmon rivers in Sweden, but only those already mentioned are on this coast; other fresh-water fishes are eels, pike, perch, bream, roach, and in the Kattegat is a fully developed marine fauna.

Products.—The southern part of Sweden is almost entirely agricultural, and the climate is exceedingly favorable for the production of grain, of which the principal crops raised are oats, barley, rye, and wheat; potatoes are also grown; the district of Kristianstad and Malmöhus produce 33 per cent and 30 per cent, respectively, of the whole barley and wheat grown in the country.

Cattle rearing and horse breeding are carried on extensively, and on most of the coast there is an average of 400 cows to every 1,000 of population; butter occupies the first place in dairy farming products, the cheese made being scarcely equal to the consumption.

The forest industry of Sweden is considerable, as fully half of the country is covered with wood, but in the districts of the west coast the area under forest is the smallest; there are no iron ore fields.

Trade.—The principal exports are timber, butter, iron, steel, wood pulp, paper, matches, stone, iron and zinc ores, and the imports coffee,

wines, tobacco, coal, wool, cloth, yarn, cotton, hides, manure, iron, fish, oils, wheat, rye, pork, and machinery.

Ports.—The principal ports on this coast are Marstrand, Göteborg, Varberg, Halmstad, Helsingborg, Landskrona, and Malmö.

Communications—Steamships.—The Thule Steamship Co. have a weekly service of steamers leaving Harwich every Saturday, so that Stockholm can be reached from England in about two days. Weekly steamers of the Wilson line leave Hull every Thursday and Grimsby every Saturday, and there is also a steamer from Granton on the latter day; the journey occupies about 36 hours.

Göteborg has steamer communication with Frederikshavn daily; with Copenhagen three or four times weekly; with Christiania and Hamburg twice weekly; with Lübeck three or four times weekly; and with West Hartlepool every fortnight, during the season. There is a regular service of steamers to Stockholm through the Götha and Trollhättan Canals.

Steamers of the Wilson line from Grimsby run to Malmo every alternate Tuesday, and Malmö has steamship communication daily with Copenhagen and Lübeck.

Helsingborg has daily steamers to Helsingör and three times every week to Copenhagen.

Railways.—Göteborg has railways to the north to Uddevalla and to Venersborg, 53 miles; northeast to Lidköping and to Stockholm, the latter 284 miles; eastward to Borås; and southward to Varberg, 150 miles.

Varberg has also a line northeast to Borås, 79 miles; and south to Halmstad, 103 miles.

Halmstad has a railway to Stockholm and to Jönköping; eastward to Markaryd; and southward to Helsingborg.

Helsingborg has lines to Göteborg, Jönköping, and southward to Landskrona.

Landskrona has communication, to the eastward, with a network of lines; in the south part of the peninsula, and to the southward with Malmö, which port has a railway to Trelleborg.

Telegraph.—A submarine cable connects Göteborg with Newbiggin and another with Skagen. The coast towns are in telegraphic communication by a land line. Göteborg and Malmö are two of the four chief telegraph offices of Sweden, with a director. The telephone is extensively used.

Climate.—Owing to the influence of the Gulf stream the climate of Sweden, especially in the southern part, is remarkably mild considering the latitude, and on the west coast the average annual temperature is about 45° F.

The short summer is counterbalanced, to a great extent, by the length of the summer days and their abundant sunlight, both

having a considerable influence on animal and vegetable life. The climate may be considered as between the Continental and maritime types, approaching nearer to the latter in the southern portion.

Snow falls all over Sweden every winter, but in the south it remains only about 50 days, while in Göteborg it lies nearly double that period; during some severe winters the Sound has been covered with ice, sufficiently thick for driving on.

At maritime stations the greatest rainfall is at the latter part of summer, at some in October, and in the southern part a secondary maximum occurs in July or August; the least rain falling over the whole of Sweden in February or March. The average rainfall of the districts or läns on the west coast is as follows: Göteborg, 25 inches; Halland, 25 inches; Kristianstad, 23 inches; and Malmöhus, 21 inches.

Thunder and hail are fairly common.

Uniform time.—Mean time of the fifteenth meridian east of Greenwich, or one hour fast of G. M. T. is kept.

Denmark.—Since the peace of Vienna in 1864 Denmark has consisted of the northern half of Jutland, which extends northward from Central Europe, and of about 150 large and small islands, between Jutland and the southern shore of the Scandinavian Peninsula; the eastern side of Jutland and the large islands of Fyen and Zealand form, respectively, the western and southern sides of the Kattegat.

From the Skaw or Skagen to the southern boundary of Jutland is only about 185 miles, and it is one of the smallest of the European kingdoms, and also one of the oldest, although anything like reliable information concerning it does not date back further than the ninth century.

It comprises an area of 14,844 square miles, and for administrative purposes is divided into 18 amter, or counties, each under an amtmand or governor, and these again are subdivided into 126 herreder, or hundreds, each having a herredsfoged, birkedommer, or justice of the peace.

Physical features.—In this work it is only necessary to mention the physical features of the coast and islands which bound the Kattegat.

The whole of Denmark is low, being in no place more than about 650 feet above sea level, and more than a half of it is under 100 feet. The east coast has not the same monotonous features which characterize the west coast, but the shores are low and sandy, and there is an absence of very good harbors, although numerous fiords somewhat compensate for this; the water is generally shallow near the land.

Being divided from east to west by Lim Fiord and a chain of lakes and narrow channels, the northern part of Jutland is in reality an island; there are several lakes but none large, the most extensive only covering an area of about 24 square miles, and owing to the slightly elevated land, there are no properly named rivers, but the streams receive the name of Aa or rivulet.

The Gudenaa, the longest of these, discharges into Randers Fiord after a course of nearly 100 miles, and in its lower reach is from 150 to 200 feet broad, and has a depth of 19 feet; it is used in some parts by boats and barges, for the transport of wood from the forests.

The highest point of Zealand is Gyldenlöves Höj, which is 414 feet above sea level, and situated southwestward of Roskilde; Fröbjerg Bavnehöj, on the western side of Fyen, is only a few feet higher, but this island is generally more hilly than Zealand.

The northern coasts of these two islands are broken by several fiords, with partly wooded green banks, sloping to the water's edge.

Geology.—The substratum of the country is composed of layers belonging to chalk, or the Tertiary, or Lignite formation, and mostly covered by looser strata of diluvial origin, principally clay and sand, mixed with large and small stones, but on the eastern side chalk lies nearest the surface. Forest, fen, or heather bogs occur chiefly in Jutland, and are of considerable importance on account of the peat.

Flora and fauna.—The flora and fauna resemble those of the central European plains and south Sweden. The immense tracts of continuous forest have been all destroyed, and only about 5 per cent of the country is forest; the beech is the most common tree, and in some parts considerable areas are planted with firs. Grass grows luxuriantly in the fertile regions.

The only wild quadrupeds are the red deer and the roebuck; fallow deer have been imported. The largest animals of prey are the fox, the badger, and the otter, and the birds are principally wild fowl; a poisonous viper (Hugorm) is found in the Jutland heaths.

Population.—In 1912 the population was 5,604,192.

Products.—Agriculture employs about one-half the population, and oats, barley, rye, and wheat are grown; cattle and dairy produce are exported. Forestry and fishery are carried on, and of fish, herrings, cod, flatfish are of most consequence; lobsters and oysters are also caught. The minerals are chalk, lime, and clay, and there are factories for machinery, iron foundries, and other works.

Trade.—The principal exports, consisting of barley, wheat, bacon, hams, flour, butter, eggs, hides, skins, corn meal, oil cakes, horses, and cattle: and the imports, of coal and fuel.

Ports.—Copenhagen is the principal port, and others are Aalborg. Aarhus, Frederikshavn, Helsingör, Kolding, Korsör, Nyborg, and Svendborg.

Communication—Steamships.—Steamers of the Finland line leave Hull every Wednesday, and those of the Wilson line on the same day, for Copenhagen, and the Leith, Hull, and Hamburg Packet Co. have a sailing for the same place from Leith on Tursdays. Copenhagen has also daily steamship communications with Lübeck and Malmö; three or four times weekly with Christiania and Göteborg; three times weekly with Helsingborg; twice every week with Hangö; once every week with Abo, Stetten, and with Stetten, calling at Swinemünde.

Aalborg has a service of steamers to Copenhagen three times weekly.

Aarhus has daily steamers to Copenhagen.

Frederikshavn has daily steamers to Copenhagen, Göteborg, and Christiansand, and every four days a steamer to Christiania.

The German Mail steamers and Danish steamers run daily between Korsör and Kiel, and there is a daily service of steamers between Korsör and Tyborg.

Railways.—A main line runs from north to south, within the coast, with branches connecting with a similar line on the west coast, at Randers, Skanderborg, and Fredericia, and branches to the coast to Skagen, Frederikshavn, Mariager, Grena, Hov, and Björnsknude Point.

A railway runs east and west through Fyen, with branches north to Bogense, west to Assens, and south to Faaborg and Svendborg.

An east and west line also runs through Zealand, from Copenhagen to Kallundborg, with branches north to Frederiksværk and Helsingör, and south to Korsör, Vordinborg, Faxe Harbor and Kjöge.

Telegraph.—Submarine telegraph cables cross the Belts and the Sound, and most of the islands are similarly connected.

Climate.—As in the case of the west coast of Sweden, the climate of Denmark, owing to the equalizing influence of the sea, is considerably milder than would be expected from the latitude. Easterly gales, when they occur, bring sudden changes in the weather, with severe cold in winter and dry heat in summer, and a northwest wind, known as skaj, which is experienced in spring, is trying to human, animal, and plant life.

The middle and north of Jutland are generally the coldest, and the coasts of Fyen and the southern islands the warmest parts; the coast of Jutland is generally about 1° F. warmer than the interior. The mean annual temperature varies between about 43° and 47° F., and the mean temperature of winter is 32°, of spring 42°, of summer 61°, and of autumn 47°.

As an instance of the changeable nature of the climate, in some winters the navigation of the Belts is stopped for months by ice, whereas other winters are quite open.

The average rainfall is about 21 inches, most rain falling with west and southwest winds; a dense summer mist, known as havgusen, or sea fog, is common on the coasts.

Uniform time.—Mean time of the fifteenth meridian, east of Greenwich, or one hour fast of G. M. T. is kept.

Schleswig Holstein and German coast.—The coast on the western side of the Little Belt, from Gravenshöft, in about latitude 55° 22′, southward to Eckernförder Bay, and thence eastward to Neustadt, is Schleswig Holstein, which has an area of 7,338 square miles.

From Neustadt the coast to Travemünde is divided between Oldenburg and the Free City of Lübeck, and between Travemünde and Ahrenshoop it is Mechlenburg-Schwerin; Oldenburg has an area of 2,482, and Mechlenburg-Schwerin an area of 5,135 square miles. The remainder of the coast to Cape Arkona is Pomerania.

The early history of Schleswig Holstein is obscure, but Charlemagne conquered the Saxons who inhabited it; it became a county under the Emperor Lothaire, and in 1773 was ceded to the King of Denmark in exchange for other counties and united with the kingdom in 1805. In 1913 it was occupied by Swedish and Russian armies, but peace was concluded the following year. It was ceded to Germany in 1864.

Physical features.—A ridge of hills divides the country from north to south into two inclined planes, running on the west side to the River Elbe and on the east to the Baltic.

Rivers.—On the west side of the watershed the Alster, the Pinnau, the Krukau, the Stor discharge into the Elbe; on the east it is more hilly, and the rivers which flow into the Baltic are the Schwentine and Trave.

Lakes are numerous, the principal being the Plon and the Selent.

Population.—In 1910 the population of Schleswig Holstein was 1,621,004.

Products.—The country is fruitful and grain grows abundantly, horses and cattle are reared, and dairy produce and peat are exported.

Ports.—The principal ports are Flensburg, Kiel, Travemünde, Warnemünde, and Wismar.

Communications—Steamships.—The Imperial German Mail steamers and the Danish State Railways steamers have two services daily to Korsör, from which there is railway communication with Copenhagen; the passage between Kiel and Korsör occupies about 5 hours.

Railways.—There is direct railway communication with Hamburg, and lines to Flensburg, Fredericia; at Neumünster Junction are also lines in various directions.

Telegraph.—There is telegraphic communication with all parts, and local submarine telegraph cables cross Kiel Fiord.

Kaiser Wilhelm Canal, through which vessels exceeding 30 feet draft can pass, connects the Baltic with the North Sea and is entered at Holtenau, a short distance northward of Kiel; it is fully described hereafter.

Uniform time.—Mean time of the fifteenth meridian, east of Greenwich, or 1 hour fast of G. M. T. is kept.

Winds and weather.—The wind having a tendency to circulate round areas of low and high pressure, but in opposite directions, both its direction and force are intimately connected with the state of atmospheric pressure. The circulation round low-pressure areas, known as the cyclonic system, is, in the Northern Hemisphere, from right to left; and that round high-pressure areas, known as the anticyclonic system, from left to right.

Over the whole of Denmark southwest and west winds are about equally common; next in frequency are northwest and southeast winds; whilst north winds are the rarest of all, but observations show that following the track of a vessel from the North Sea through the Skagerrak and Kattegat into the Sound and through to the Baltic, the average direction becomes more southerly near the entrance of the Skagerrak, more westerly near the Skaw, and again more southerly through the Sound and into the Baltic, than the annual average direction of the whole.

The frequency of the winds from the different points for the whole of Denmark expressed in percentage is as follows:

N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.	Total.
6	9	10	12	11	18	18	12	4	100

Observations show that west and northwest winds are the strongest, blowing with greater strength in autumn and winter than in spring and summer, the stormiest months being from October to February, inclusive.

Gales are mostly caused by cyclonic systems of pressure, and the changes of wind to an observer depend upon his position with regard to the center of the depression and the direction in which it is traveling; though the depressions are very erratic in their course toward and over Europe, they generally approach from some westerly point and move in some direction between northeast and southeast.

If a breeze commences from the southeast, and the center of the depression is passing northward of the observer, the wind will veer from southeast, through south and southwest, to west; if the center is passing southward of the observer, the wind will back, through east and northeast, to north.

The well-known rule for ascertaining the position of the central point of the area of low pressure in the Northern Hemisphere is, to face the wind, when the center will be from 8 to 12 points to the right of the wind's direction, but the general rules for the avoidance of these storms can not be followed owing to the narrow waters.

Every endeavor being made by storm signals to warn the navigator of their approach, and anchorages being generally available where proper precautions can be taken, there should be little risk of a vessel encountering such storms under way.

The British Islands being directly in the track of the cyclonic disturbances most likely to influence the weather of Denmark, the latter holds a particularly favorable position for acquiring an early knowledge of anything likely to affect its coasts, as telegraphic intelligence gives frequently at least two days' warning of the approach of gales.

Of the barometric depressions passing over this locality and affecting its weather, the centers of about 70 per cent pass northward, and only 30 per cent southward, of Denmark; in the winter months the number passing northward is at its maximum.

The average number of gales, i. e., of winds blowing with a force of 7 (Beaufort scale) and upward, for the whole of Denmark for one whole year is 35, and these occur in the following proportions, according to the season: In winter, 12; spring, 7; summer, 5; autumn, 11. Most of the gales, viz, 71 per cent, may be said to exhaust their strength in one quarter; and 40 per cent keep within the western quarter; whilst exactly half, or 50 per cent, commence from between west-southwest and west-northwest.

The percentage commencing from other quarters are 23 in the south, 18 in the east, and only 9 in the north. The strength of gales is also greater in the Skagerak and in the entrance to the Baltic than in the Kattegat and narrower waters of the Sound and Belts.

The percentage of hazy or thick weather during gales at Anholt is 29 in winter, 18 in spring, 7 in summer, and 16 in autumn, and of fogs 7 in winter, and about 1 per cent for spring and autumn.

Storm signals.—Swedish signals, made by cones and balls painted black, are shown from masts at Marstrand, Vinga, Varberg, Morups Tånge, Torekov, Helsingborg, and Malmö, as follows:

Signal.	Signification.
One cone, point upward	Gale expected between north and east.
One cone, point downward	Gale expected between south and west.
One ball	Gale expected, no direction signified.
One cone, point upward over ball	Storm expected between north and east.
One ball over cone, point downward	Storm expected between south and west.
Two balls, placed vertically	Storm expected, no direction signified.

Storm warnings are also posted on boards at Göteborg, Långedrag, Falkenberg, Halmstad, Möllehamn, Lerberget, Råå, Borstahusen, Malmö, Limhamn, and Skanör.

NOTE.—A gale is considered as having a velocity of 40 to 65 feet per second, or a force of from 7 to 9, and a storm a velocity of from 65 to over 100 feet per second, or a force of from 10 to 12, according to the Beaufort scale.

Danish storm signals are made by means of cones and balls displayed at one end of a yard and flags or lights on the other end, and are as follows:

Signal.	Signification.
One black ball	An atmospheric disturbance in the neighborhood; gale expected.
One black cone, point upward	Gale expected from between north and west.
One black cone, point downward	Gale expected from between south and west.
Two black cones, shown vertically, points upward	Gale expected from between north and east.
Two black cones, shown vertically, points downward	Gale expected from between south and east.

One red flag by day, or a fixed red lantern light by night, displayed with any of the above signals, indicates that the wind is veering, or shifting to the right.

Two red flags by day, or two fixed red lantern lights displayed by night, indicate that the wind is backing or shifting to the left. The above lights will be screened in such a way as to prevent their being mistaken for lights exhibited for the purposes of navigation.

The above signals are made from the undermentioned places: The Skaw, Frederikshavn, Aalborg, Aarhus, Helsingör, Copenhagen, and Odense.

German storm signals.—The storm signals in use at nearly all the stations on the German coast are made by means of cones, as under:

1. A cone, point downward, indicates a storm from southwest.
2. A cone, point upward, indicates a storm from northwest.
3. Two cones, vertical, points downward, indicate a storm from southeast.
4. Two cones, vertical, points upward, indicate a storm from northeast.

In addition to the cones, one red flag indicates that the storm will probably veer from left to right, or in the direction of the hands of a watch; two red flags, that the gale will probably back in the opposite direction. At a few of the less important stations under provincial

control, a ball only is hoisted, signifying that an atmospheric disturbance is present, particulars being obtainable from a box attached to the signal post.

By night a single red lantern takes the place of the cones, excepting at stations where it might be confused with other red lights.

The signals are made at the following places: Aarösundhafen, Apenrade, Flensburg, Schleimünde, Bülk, Labö, Friedrichsort, Kiel, Heiligenhafen, Orth, Marienleuchte, Burgstaaken, Travemünde, Lübeck, Wismar, Warnemünde, Darsser Ort, Barhöft, Stralsund, Dornbusch, Wittower, and Cape Arkona.

Experimental night storm signals.—The following night storm signals will be shown, until further notice, from the yard of the signal mast of the storm signal stations at Friedrichsort, Marienleuchte, Darsser Ort, and Cape Arkona.

Two red lights, vertical, storm from northwest. Two white lights, vertical, storm from southwest. Red light above white light, vertical, storm from northeast. White light above red light, vertical, storm from southeast.

An atmospheric disturbance will be indicated by one red light at Friedrichsort and Darsser Ort, and by two red lights, one at each yardarm, at Marienleuchte and Cape Arkona, corresponding to the ball by day.

Radio telegraph signals.—Storm warning signals for the German Baltic coast, or its western part, are made from Bülk Point wireless station at 1 p. m. and 11 p. m., mid-European time, and also at such times as warnings may be received from the German meteorological office.

Weather reports will be made on application from the above station (call signal K. B. K.) at the rate of 15 pfennigs (about 3 cents) per word.

The storm warning signals and weather reports will be sent on the 1,650-meter wave length; weather reports will be of about 15 words, unless otherwise stated.

Storm warning signals are made in accordance with the system described above, and are to be considered to hold good until the evening of the day following their issue.

A weather report is made daily at 1h. p. m., mid-European time, from the Norddeich wireless station. The report consists of not more than 25 words, and contains a summary of the observed distribution of atmospheric pressure over Europe at 8 a. m., information as to the wind conditions in the North Sea and Baltic, and a weather forecast.

Vessels equipped with radiotelegraph apparatus are requested to notify storm warning to other vessels; by day, by means of a ball and cones, as shown upon the German coasts, and at night by means

of the Morse code or two lanterns. A call or closure signal is not given in this night storm signaling.

The following are the Morse signals and their significations:

Morse signal.	Signification.	Remarks.
— - - -	Atmospheric disturbance....	Takes the place of ball.
- —	Storm from Northwest.....	Corresponds to the day signals with the cone, the dot representing the apex, and the dash the base of the cone.
— -	Storm from Southwest.....	
- — - —	Storm from Northeast.....	
— - — -	Storm from Southeast.....	

Wind signals—The Skaw.—A wind signal station, situated 270 yards northwest by north of the lighthouse, indicates the weather conditions at Hanstholm and Anholt, and consists of a lattice-work structure, the principal mast of which is 96 feet in height, with a horizontal yard pointing north and south.

Midway between the center mast and the yardarms, on each side, is a smaller lattice-work structure, and where these join the yard are circles to indicate the direction of the wind. On each side of the center mast, and above the yard, are semaphore arms which indicate the force of the wind.

Above the yard, on the north side, the letter "H" indicates that all signals on that side refer to Hanstholm, and the letter "A," similarly placed on the south side, shows that the signals are regarding Antholm. To assist in reading the signals when seen from behind, an Ø, signifying east, is placed on the north, and a V, signifying west, on the south yardarm. For indicating the direction of the wind by the pointers, the top of the circle denotes the north, and Ø and V the east and west, respectively.

In indicating the force of the wind by the semaphore arms, each arm, placed horizontally, commencing from the top, represents a force of 2 of the Beaufort scale; the pointer and all arms turned downward represents a calm, and when no information can be given, the upper arm is placed at an angle of 45° above the horizontal.

Helsingborg.—A wind signal station, situated southward of the lighthouse on the north pierhead, gives information as to the direction and force of the wind at Varberk, and consists of a black dial, with a white edge and white pointer, and below it black triangular shaped boards, displaying either one, two, or three white disks.

The forces of the wind are represented as follows:

One disk on the black triangular shape denotes that the wind at Varberg is a steady, or fresh, topgallant breeze.

Two disks, that it is a topsail, or reefed topsail, breeze.

Three disks indicate from a close-reefed topsail breeze to a gale.

When no disks are displayed, and only the black triangular shape shown, it denotes calms or light and variable winds.

The information is telegraphed from Varberg between 8h. and 9h. a. m. and 2h. and 3h. p. m.

Helsingör.—Wind signals at Helsingör are made on the pilot house on the south mole, from which also ice and other signals are made; they represent the conditions of wind at Anholt.

The magnetic direction of the wind is given below for the position of the pointer for the cardinal points, and intermediate positions must be judged.

Pointing upward, wind from north.

Horizontally to the right, wind from the east.

To the bottom, wind from south.

Horizontally to the left, wind from the west.

The forces of the wind are shown by from one to three white disks, displayed along the front of the platform railing.

One disk denotes light winds.

Two disks denote a strong breeze.

Three disks, a double-reefed topsail breeze to a gale.

When no signal can be given, the pointer is directed upward, and no disk is exhibited.

These signals, which should be visible in clear weather from a distance of 3 miles, are shown at all times, being altered whenever there is a change in either the direction or the force.

Currents.—The currents in the Kattegat are the result of several influences, the principal of these being the differences in density between the salt water which enters from the North Sea and the fresher water of the Baltic, which latter rising to the surface enters as a north-going stream, through the Sound and the Belts.[1]

If calm weather conditions prevailed, this north-going current would probably be more or less constant, the limits of its extent to the northward being dependent on the volume of water from the Baltic, and so its farthest advance in that direction, and its greatest strength, would occur during the months of April and May, when the German and Russian Rivers break up; also at that time easterly winds are prevalent and help to drive the water out of the Baltic.

But such regularity is altogether checked by the winds that not only are but have been prevalent, and hence any attempt to arrive at a definite conclusion either as to the direction or velocity of the currents is impossible, although from a long series of observations the effect of the prevalance of certain winds may be conjectured.

It has been generally found that winds from northeast, through east and south, to west cause a north-going current, whereas those from west and north have an opposite effect. Northeast winds are said to almost invariably cause a north-going current, and in fact the

[1] The specific gravity of the North Sea water is about 1.027 and that of the Baltic water 1.003.

strongest stream in that direction is often the result of a continuous hard blow from that quarter, as blowing over the Gulfs of Bothnia and Finland, it drives a quantity of water into the Baltic.

The configuration of the bottom of the Kattegat, with deep veins running between shallow ground, and the numerous islands and detached shoals, all contribute to the diversion of the regular course of the currents, and in addition in some localities there are tidal influences.

South-going current.—The south-going current, entering from the Skagerrak, passing the Skaw and slightly deflected toward the north by the shoal extending off it, sets across the entrance to the Kattegat, in an east-northeast direction, toward Marstrand at rates of from 1 knot to 2 knots, the latter increased during southwest gales.

On nearing the Swedish coast this stream bifurcates, one branch running northward and the other southward along the coast, varying its distance from it; the northern branch of this current does not require further notice in this work.

The southern branch, following the vicinity of the line of Rännan Deep, throws off a stream in a west-southwest direction, by the deeper vein leading to and through Læsö Channel; the main branch running down the coast bifurcates when nearing Anholt, one branch continuing through the Sound and the other, passing northward of Hesselö and on both sides of Schultz's Ground, running into the Great Belt.

But in addition to this south-going branch of the current setting across the entrance, a large volume of water also finds its way into the whole breadth of the northern part of the Kattegat, which sets toward the northern side of Læsö, and past each end of that island.

The eastern of these streams, passing between Læsö Trindel and the east extreme of Læsö, runs to the southward, eastward of Kobber Ground, from which it sets on and toward each end of Anholt, the main current passing Öster Reef and setting toward Nakke Head, where it divides, one branch proceeding through the Sound and the other to the westward on the north side of Zealand.

This current, after passing Öster Reef, also sends a branch in a south-southwest direction, which sets northward of Hesselö and toward Schultz's Ground.

The current which sets on to the northern sides of Læsö and Anholt in both cases is deflected to the eastward.

The current which passes the western extreme of Anholt will be mentioned hereafter, as it unites with other streams.

The other branch, from the northern part of the Kattegat, which runs through Læsö Channel, sets to the southward across Aalborg Bay, receiving on its eastern side the streams that have branched to the westward from eastward of Læsö, and west of Anholt, and also

the western branch from the bifurcation, after passing the eastern end of the same island.

On the eastern side it is joined by a current setting to the eastward along the south side of Aalborg Bay and over Tangen Bank, and the combined stream runs into the Great Belt, but before doing so it throws out a branch round the north side of Samsö, which, following the west coast of that island, bifurcates at its southwest point, the two branches so formed setting through the Great and Little Belts, respectively.

From what has been already mentioned regarding the differences in density between the south-going and north-going currents, it will be understood that the former is dependent on the distance the latter extends to the northward for the positions at which the various branches cease to be surface, and become undercurrents following the lanes of deepest water into the Baltic.

North-going current.—It has already been stated that the current from the Baltic finds its way into the Kattegat by the Sound and the two Belts, and in the case of the first it bifurcates on leaving the Sound, one branch running up the Swedish coast, and if reaching Marstrand, uniting with the northern branch of the current that crosses from the Skaw. With strong winds between northeast, through east to south, this stream on the Swedish coast attains considerable velocity.

The other branch has a northwest direction between Hesselö and Stora Middel Ground, where, meeting a branch of the north-going stream from the Great Belt, it sets eastward of East Reef and of Læsö, uniting northward of that island with a north-going branch from its west end, and together setting across toward Marstrand.

The north-going current out of the Great Belt passes on both sides of Paludan Flat, then runs westward of Samsö, where it is joined by the current from the Little Belt, and these again unite near Hjelm with the main branch from the Great Belt and so set between Fornæs and Anholt, across Aalborg Bay and through Læsö Channel.

Near Schultz's Ground this current throws out branches both eastward and westward of that bank, and these set toward Anholt and eastward of it, and as Læsö Channel is not sufficient to allow the passage of the whole of the current, a portion of it, passing along the southern side of Læsö, joins the north-going stream running past the eastern end of that island.

After passing Læsö the whole of the north-going current continues to the northward or sets northeastward toward Marstrand, although in some cases a portion follows the coast of Jutland to the reef at the Skaw.

The north-going current from the Little Belt runs along the northern side of Fyen as far as Æbelö, where it turns northward to the east point of Endelave Island, and then along the west side of Samsö, between it and Tunö, but with strong westerly winds a portion of the current may pass south of Samsö and into the Kattegat.

It has been mentioned that islands and reefs deflect the course of the currents, and as an instance the East Reef of Anholt, which lies in the course of currents passing the east end of that island, has the effect of turning the north-going stream to the eastward toward the vicinity of Morups Tånge, from which it sets northwestward between Fladen and Kobber Ground, and so to the east end of Læsö, and as a proof of this it is said that during severe winters the ice is piled up by it in the neighborhood of Morups Tånge.

The direction taken by the currents and their branches, which has been described, is that observed during ordinary conditions, and strong winds cause several small alterations or modifications, but as these could not be depended on, and would probably only serve to confuse, they are not given.

Observations at lightvessels.—The observations on the currents at the several lightvessels in the Kattegat and the Sound have been made synchronously, and when strong winds were blowing at the Skaw, i. e., winds of a force of 7 or more of the Beaufort scale, it being argued that with these winds the currents would also be found at or near their maximum velocity.

But although the currents may be strong at the Skaw and calms of rare occurrence, the lightvessels farther south in the Kattegat, partly from their sheltered positions, do not experience the same wind conditions, and the occurrence of calms increases; therefore the same results from force of wind can not be expected throughout.

Skaw lightvessel.—In the vicinity of the Skaw lightvessel the east-going current, which prevails almost continuously, is not greatly influenced by the winds from various quarters that are, or may have been, blowing, but those from between southwest, through west to northwest, somewhat accelerate it, and observations which are continually made in the lightvessel show that with strong west winds the easterly current may attain a rate of 3, and even 4, knots an hour.

Nor does this almost continual east-going current appear to be considerably deflected by strong winds from northwest or southwest, which seldom alter its direction to the southward of east by south, nor to the northward of northeast by east, respectively.

The effect of southeast winds is to alter this current to one in a northeast or even north direction, and to somewhat reduce its velocity, although it has been found setting with a velocity of 2½ knots in these directions.

An abnormal effect is produced by northeast winds, which frequently cause a north or northeast going current, which can only be accounted for by supposing that a head of water accumulated on the east coast of Jutland, and, unable to flow through Læsö Channel, expends itself in this manner.

Calms are seldom experienced in the neigborhood of the Skaw, but the effect they produce is probably to diminish the rate of the east-going current; but it would be far from prudent to depend on such a result happening, as it is quite possible that the current may have a rate of 2½ knots, under such condition.

Læsö Trindel lightvessel.—In considering the current at Læsö Trindel and some other lightvessels, it has been found that a connection exists dependent upon the winds that may be blowing at the Skaw lightvessel, and these latter are therefore given in describing the several conditions of currents.

With strong northeast winds at the Skaw, the currents at Læsö Trindel were almost entirely setting in directions between northeast and northwest, the former set being experienced at the commencement of that wind, and turning to the latter direction on the wind continuing from that quarter.

With winds from the southeast at the Skaw, the largest percentage of currents being between southeast and northeast, the set may be considered as almost entirely an east-going one, weak to the southeast at the commencement of the wind, but working to the northeast, and even northwest, with an increased rate on that wind being long established; the southeast current at the commencement is probably due to it being a continuance of the current caused by a west wind preceding that from southeast.

With strong southwest winds the currents set principally to the southeast and southwest, the latter predominating, but generally weak, although it sometimes attains a rate of 1½ knots.

With strong northwest winds, the current at Læsö Trindel sets southeast, southwest, and northwest in the order of their occurrence.

The tendency of the currents to set directly against, or slightly oblique to, the wind prevailing, will be noticed in the above observations, and considering that from the four quarters mentioned the percentage of this anomaly is from 25 to 96 per cent, it would appear that some other causes than those already given must be sought for in explanation.

Læsö Channel lightvessel.—The currents in Læsö Channel are less complicated than those of Læsö Trindel, as they usually set in one of two directions, to the north by east or to the south by west. The winds mentioned below are those at the Skaw lightvessel.

With strong winds from northeast, the set is mainly to the north by east, or against the wind, which may be due to a head of water on the east coast of Jutland, as already mentioned.

With strong southeast winds, the current almost invariably sets to the north by east, attaining considerable velocities, and frequently reaching 3 knots; this is probably the result of the southeast winds checking any escape of current by the southern end of the channel.

With strong southwest winds the current sets to the south by west during about two-thirds of its duration, which is again an example of its direction being almost directly in opposition to the wind.

With strong northwest winds, the direction of the current is almost entirely south by west.

The following are the results obtained from 200 observations, taken simultaneously at the Kobber Ground, Anholt Knob, and Schultz's Ground, and also at the same times as those already given for other lightvessels, the winds given being those blowing at the several lightvessels, but agreeing with those at the Skaw, and with a force of 7, or over, of Beaufort scale. Since these observations were taken, the Kobber Ground lightvessel has been removed and replaced by a beacon.

Kobber Ground.—With strong northeast winds the current in nearly three-quarters of the whole was setting to the northeast, and on a few occasions to the northwest, the velocity being 1¼ knots.

With strong southeast winds the current sets almost entirely to the northeast, attaining a rate of 1¾ knots.

With strong southwest winds the current sets to all four quarters, but with a preponderance to the northeast, and one-fifth of the currents were in a northwest direction, against the wind, but with a rate of only half a knot, while the others attained a velocity of 1 knot.

With strong winds from northwest the principal set was against the wind, or to the northwest, but currents setting to the southeast were nearly as frequent, as with southwest winds the current against the wind was weak, being only ½ knot, those to the southeast having a rate of 1 knot.

The currents observed at this lightvessel will be found to agree in many ways with those of Læsö Trindel, already given.

Anholt Knob lightvessel.—With northeast winds there was also a preponderance of currents setting against the wind, the remaining currents being to the northwestward. A distinctive feature in the currents setting against the wind was the increase in rate above that of the more northern stations, as these currents reached a velocity of 2¼ knots.

With southeast winds the set was chiefly to the northeast, the remaining currents being southeast. The former had a maximum rate of 2½ knots and the latter 1¼ knots.

With southwest winds the main set was to the southeast, the remainder being to the northeast and the velocities 2¾ and 1¼ knots,

respectively. It will be noticed that this is the first occurrence since the Skaw lightvessel of the predominance of an easterly current with this wind.

With northwest winds the principal current was to the southeast, then to the northwest, and to the northeast. The rates attained being, respectively, 3 knots, 1 knot, and ¾ of a knot.

As the direction of the currents at this lightvessel have, in some instances, a tendency to affect the safety of a vessel navigating in the vicinity, they will be specially noticed hereafter. (See Chapter IV.)

Schultz's Ground lightvessel.—With northeast winds the set was entirely to the northeast, or against the wind, the maximum rate being 2½ knots.

With southeast winds there was a large percentage of northeast-going current, the other sets being to the southwest and northwest, the first attaining a rate of 3 knots and the others about ¾ of a knot.

With southwest winds the set was again chiefly against the wind, with a few instances of currents to the northeast, the northwest, and to the southeast; the southwest current attained a velocity of 3½ knots, and those to the northeast and northwest 1¾ knots.

With northwest winds, southwest and northwest currents were experienced, the former slightly in excess of the latter; the rates, respectively, being 3 knots and 2 knots.

These currents will be mentioned further in the description of the locality. (See Chapter IV.)

A similar number of observations were made synchronously with those already given, at the Lappe Ground, Drogden, and Gjedser lightvessels.

Lappe Ground lightvessel.—Owing chiefly to the position of this lightvessel the currents are mostly northwest by north, or southeast by south going, the former with all winds with easting in them.

With northeast winds they were entirely northwest by north, the velocity varying between 1¾ and 2¾ knots.

With southeast winds the set was also wholly to the northwest by north, the rates being from 1¾ to 3¾ knots.

With southwest winds the set was divided, two-thirds showing a southeast by south and one-third a northwest by north direction.

With northwest winds, with one exception, the currents were to the southeast by south the velocity reaching 2¾ knots; in the opposite direction the rate was nearly 2½ knots.

Drogden lightvessel.—From the direction of the Flint Channel the currents, which otherwise have a marked similarity to those at Lappe Ground, are northeast by north and southwest by south, instead of northwest by north and southeast by south.

With northeast winds the current was northeast by north.

With southeast winds the currents set northeast by north.

With southwest winds the currents were divided, three-quarters setting southwest by south and one-quarter setting northeast by north.

With northwest winds the set was practically all to the southwest by south.

Gjedser Reef lightvessel.—At this lightvessel the winds were generally lighter and more calms prevailed.

With northeast winds the observations were very few, and gave two-thirds northeast by north and one-third northwest by west current.

With southeast winds a southwest-going current prevailed, which attained a velocity of 2¼ knots.

With southwest winds the currents were about equally divided between northeast and southwest, the former reaching a rate of 2 knots and the latter 2½ knots.

With northwest winds the principal current was to the southeast, then a northeast and southwest set in order of occurrence, the rates attained being 2¼, 2, and 1¼ knots, respectively.

Table showing the currents experienced with northeast, southeast, southwest, and northwest winds, being the result of a number of observations, taken synchronously on board the lightvessels mentioned; the currents are given in the order of frequency of occurrence:

Light vessel.	Wind.	Current.							
		Direction.	Rate.	Direction.	Rate.	Direction.	Rate.	Direction.	Rate.
			Knots.		*Knots.*		*Knots.*		*Knots.*
The Skaw	NE.	N.	1 -2	NE.	1 -2				
Do	SE.	E.	1 -1½	N.	1½-2½	NE.	1 -2		
Do	SW.	E.	1½-3	SE.	1½-2	NE.	1 -1½	N.	1 -1½
Do	NW.	E.	2 -3	SE.	1½-2½	N.	1½		
Læsö Trindel	NE.	NW.	1 -2	NE.	1½-2½	N.	1½	S.	½
Do	SE.	NE.	1 -2	SE.	¼- ¾	S.	½- ¾	NW.	¼-1¼
Do	SW.	SW.		SE.	¼-1½	NE.		NW.	¼-1
Do	NW.	SE.	½-1	SW.	½-1	NW.	¼-1	NE.	½
Læsö Channel	NE.	NNE.	½-2	SSW.	1 -2				
Do	SE.	NNE.	½-3	S.	1½				
Do	SW.	SSW.	½-2	NNE.	½-1				
Do	NW.	SSW.	½-2½	NNE.	1 -1½				
Kobber Ground	NE.	NE.	¼-1¼	NW.	1½				
Do	SE.	NE.	1½	NW.	1½				
Do	SW.	NE.	½-1	SE.	½-1	NW.	½	SW.	½-1
Do	NW.	NW.	½	SE.	1	SW.	½	NE.	½
Anholt Knob	NE.	NE.	¾-2¼	NW.	½-1½				
Do	SE.	NE.	¾-2½	SE.	¼-1¼				
Do	SW.	SE.	½-2½	NE.	¼-1¼				
Do	NW.	SE.	¾-3	NW.	¼-1	NE.	½- ¾		
Schultz's Ground	NE.	NE.	1 -2½						
Do	SE.	NE.	¾-2¼	SW.	½	SE.	½- ¾	NW.	¾
Do	SW.	SW.	½-3½	NE.	½-1¾	NW.	¾-1¾	SE.	1
Do	NW.	SW.	¼-3	NW.	½-2				
Lappe Ground	NE.	NNW.	1¾-2¾						
Do	SE.	NNW.	1¾-3¾						
Do	SW.	SSE.	¼-2¾	NNW.	2¼				
Do	NW.	SSE.	¼-3	NNW.	1½				
Drogden	NE.	NE.	1¼-2¼						
Do	SE.	NE.	¼-2¼						
Do	SW.	SW.	¼-3	NE.	¼-1¾				
Do	NW.	SW.	¼-2½						
Gjedser Reef	NE.	NE.	¼-1½	SW.	1				
Do	SE.	SW.	¼-2¼	NE.	¼				
Do	SW.	SW.	¼-2½	NE.	¼-2				
Do	NW.	SE.	1 -2¼	NE.	½-2	SW.	1 -1½		

German current signals.—Signals indicating the direction and velocity of the current are made from dawn to dusk by the following shapes, flags, and pennants from Gabels Flat lightvessel.

DIRECTION SIGNALS.

Signal.	Indication.	Signal.	Indication.
2 cones, one above the other, apexes up.	Current running north.	2 cones, one over other, bases up.	Current running south.
1 cone, apex up.....	Current running northeast.	1 cone, base up.....	Current running southwest.
2 cones, one above other, bases toward each other.	Current running east.	2 cones, apexes toward each other.	Current running west.
1 ball.....	Current running southeast.	1 square shape.....	Current running northwest.

VELOCITY SIGNALS.

No signal.....	Under half a knot.	Pennant over a flag.....	From 1½ to 2 knots.
1 pennant at yardarm....	From half to 1 knot.	2 pennants, one over other.	From 2 to 2½ knots.
1 flag at yardarm.....	From 1 knot to 1½ knots.	2 flags, one over other....	Over 2½ knots.

The mean direction of the streams of the upper strata of water are given for direction, and the mean of the rates at the surface and at a depth of 18 feet are given for the velocity.

Tides.—A regular tide exists in the Kattegat as the result of the tidal wave from the North Sea, but at the Skaw, Fredrikshavn, and the entrance to Lim Fiord the difference between high and low water only amounts to about 1 foot; this, however, slightly increases toward the Sound and Belts. It is high water at Fredrikshavn at 5h. 11m. and at Fredericia at 11 h. 11m.

The highest tides in the Sound and Belts have been observed to occur from one day to two days before full and change, whereas on the North Sea coast of Jutland they happen from 1½ to 2½ days after the same. The tides in the Baltic are imperceptible.

Fluctuations of water level.—The rise and fall, or difference in the level of the water, in the various harbors on the Danish and German coasts described in this work is slight, but fluctuations, caused by the action of the wind from various quarters, raise and lower the water above and below mean level and become a matter for consideration when vessels are passing through channels or entering harbors where there is no great margin of depth.

Gales from different directions, causing abnormal fluctuations, are known as storm floods, and one of these, which occurred on November 12 and 13, 1872, affected the level in several harbors to an extent of from 9½ to 10¾ feet above and below the mean; and as the depths shown on the charts are reduced to mean low level of the water, such a considerable difference might constitute a source of danger.

Ice.—Owing to the climate of Denmark ice never forms in its harbors, nor in the Kattegat, the Belts, and the Sound to such an

extent as to become an absolute obstruction, but during most winters it is present in sufficient quantity to cause difficulties in navigation, although rarely to seriously interfere with it for any length of time; there are instances of winters where the only formation of ice has been in narrow channels or near the shore, in both cases in shallow water.

About the middle of January, or even somewhat later, easterly winds, always in winter accompanied by the lowest temperatures, set in with frequently 10 days or a fortnight of continuous frost, before sufficient ice forms in the fairways to become a hindrance to navigation, and observations show that the formation takes place firstly in the southern part, and progresses toward the north, without any reference to whether the direction of the wind has been to the northward or southward of east previously.

The earliest ice is formed on the shoal water about Zealand, in the Sound and around Copenhagen, Saltholm, and Amager, also in Drogden Channel, where the formation is further increased by drift ice from the Baltic. The entrances to fiords in Jutland and those on the north coasts of Zealand and Fyen also freeze over, and navigation, first for sailing and afterwards for steam vessels, in them is stopped.

In the Kattegat at this period the ice, known as Sjaparbrash, has only formed on the shoaler water southward and eastward of Læsö, off the coast of Jutland, and surrounding the islands, but after a week or a fortnight of steady frost ice becomes present in the fairway of the Sound in considerable quantity, and, although steam vessels can still proceed to the Baltic, they may expect to encounter masses of ice.

The harbors of the Sound are also open to them, but sailing vessels will generally require the assistance of a tug.

The Drogden and Lappe Ground lightvessels, which remain at their stations as long as possible, will now, with the Swedish lightvessels, be withdrawn, and the ice conditions of the Great Belt and Kiel Bay will probably necessitate the stoppage of the regular mail steamers.

With a continuation of the frost only a short period will elapse before ice forms in the east and west channels of the Kattegat, which it does in small, round sheets, frequently covering large areas, and known as plate ice; given a sufficiently low temperature and calm weather this ice forms very rapidly, and, covering the Kattegat, is augmented by packing.

Thin ice forms earlier in the Kattegat than in the Sound and Belts, and especially so with northeast and easterly winds, when the temperature is considerably lower, and with calms, or light winds, its formation is very rapid on the Swedish coast, being much aided

by the surface or north-going current, which, dependent on its extension to the northward, brings fresher water from the Baltic into Engelholm and Laholm Bays.

Instances have occurred of the formation of thin ice from Kullen as far northward as Morups Tånge or Anholt while the Sound was free from ice.

When the Kattegat is almost entirely frozen over navigation becomes impracticable for steam vessels, for, although weaker ice, and even open channels exist along the Swedish coast, the ice in the contracted part of the channel, southward of the Kullen, may be found to be impassable, and there would be a risk in attempting to force it when both the propellers and rudders of vessels are liable to be damaged.

When ice is present in considerable quantity in the Kattegat it would be prudent to avoid the vicinity of that part which lies between Anholt and Morups Tånge, and also the neighborhood of the Paternosters, as in these localities the ice is liable to pack, owing to the east-going currents setting toward the coast.

In the event of being caught in the ice it would be advisable to prepare the boats as regards provisions, water, and other necessities, with a view to the contingency of requiring to desert the vessel, which might be drifted by the currents into shoal water, when the position would probably become dangerous, although instances have occurred of vessels of various sizes remaining in the ice for several weeks without sustaining any damage.

The Skaw lightvessel, having both Swedish and Norwegian harbors of refuge, is not dependent on Danish ports, so can remain out probably longer than any of the lightvessels, while Læsö Channel and Læsö Trindel will be almost the first to be withdrawn.

Lappe Ground lightvessel remains out as long as there is a possibility of getting refuge in Helsingör, and the Drogden vessel is similarly situated as regards Copenhagen; both vessels are laid out again immediately the conditions become favorable.

The dates of commencement and the duration of frost being so variable no serviceable data can be given, but it may be said that its commencement extends from the beginning of December to the beginning of February, continuing sometimes to the end of March; it has been observed that frost commencing early in December, a rare occurrence, is never of long duration.

Westerly winds, usually bringing a thaw, first break up the ice, assisted by the high water accompanying them, which lifts the ice and so allows it to drift outward, and the western channel of the Kattegat may become clear in three or four days; but, on the other hand, any check to these winds and a continuance of frost will cause a return to the ice conditions. The Great Belt generally becomes

navigable at the same time as the Kattegat, while the Sound may be blocked.

The current sometimes clears the channel between the Skaw and Fredrikshavn so that harbor becomes accessible, and Grenaa is considered as a refuge harbor for small vessels meeting ice, but with easterly winds prevailing it is liable to be closed.

Although the ice information hereafter given is often of service, yet the changes are frequently so rapid that on arrival at places concerning which information has been obtained the conditions may be found to be totally altered.

As instances of the ice conditions in the Kaiser Wilhelm Canal, the state of the ice in three winters which were severe, moderate, and open and mild, respectively, may be mentioned. In the winter of 1908–9, which was severe, ice breakers were employed on 17 days; in 1909–10, a moderate winter, the canal was closed for sailing vessels on three days; and in 1910–11, a mild winter, the canal was altogether open for sailing vessels. (See Tables of ice conditions, Appendix.)

Ice terms.—The following terms are used at Danish ice-signal stations to express the various conditions of the ice:

Sjap (*brash*).—A collection of very small detached particles.

Kvadder (*pancake*).—Newly-frozen ice of insufficient thickness to prevent navigation, and present usually in rounded cakes.

Driv (*drift*).—Detached ice floes, or bergs, divided into Spredt (scattered) and Svær (heavy).

Pak (*pack*).—A large collection of pieces of ice from broken-up floe or icebergs, which have more or less closed together again.

Skrue (*screw*).—Ice with a circular motion, caused by conflicting currents.

Tyndfast (*thin fixed*).—Ice of a thin character, fixed to the shore.

Sværfast (*heavy fixed*).—Heavier ice fixed to the shore.

Ice signals.—With a view to affording the earliest information available to vessels navigating between the North Sea and the Baltic, and vice versa, as regarding the ice conditions in the Kattegat and the channels south of it, signals are made at the following places:

Danish coast.—The Skaw, Fornæs, Sejrö, Helsingör, and Kjelsnor.

Swedish coast.—Vinga, Kullen, Helsingborg, and Falsterbo.

Lightvessels and lightbuoys.—Signals are also made when lightvessels or lightbuoys are withdrawn on account of ice.

Danish coast.—The Skaw, Fornæs, Sejrö, Helsingör, and tion, are made from the following places: The Skaw, Anholt, Fornæs, Sejrö, Kjelsnor, Kronborg, and Helsingör.

Swedish signals.—Signals regarding lightvessels are made at Vinga, Kullen, Helsingborg, and Falsterbo.

Ice signals, only intended to convey a general warning that the locatities mentioned should be avoided unless prepared to meet ice, are not shown until the navigation of the channel indicated is closed for sailing vessels.

As the increase of ice first necessitates the withdrawal of the light-buoys and then the lightvessels, the amount of ice formed can be surmised, for places concerning which signals are made.

When a lightvessel is withdrawn, it signifies that heavy ice is forming in the channel, or channels, in that locality, and that steamers of ordinary power can not navigate there without risk, and the withdrawal of all lightvessels denotes a considerable increase in the danger of navigation generally.

"Ice in the fairway" signifies that navigation in the locality is closed for sailing vessels.

"Blocked by ice" signifies that navigation in the locality is closed for steam as well as sailing vessels, but not necessarily for ice breakers.

It should be remembered that time may not have permitted the lightvessels being replaced, although the ice has broken up, and the channels are clear.

The Skaw—Ice.—The day signals are made by means of black tablets or squares placed in front of a white patch, painted on the northern side of the lighthouse, and more than one patch may be exhibited at the same time.

1. Square, left top corner.....Ice in the vicinity of Vinga.
2. Square, left bottom corner.....Ice in Læsö Channel.
3. Square, right top corner.....Ice in Kattegat, East Channel.
4. Square, right bottom corner.....Ice in northern entrance to the Sound.

Lightvessels.—Signals regarding lightvessels and lightbuoys are made by red balls, hoisted on a cross yard surmounting the old Skaw Lighthouse, and to form a correct idea of the state of the ice in the Kattegat, these signals should be compared with the ice signals that may be exhibited, but the signal that a certain lightvessel is not in station will indicate that ice may be expected in that locality, even if the ice signal is not made.

Where "lightbuoys" are given against a signal instead of the name of a lightvessel, it indicates that light buoys must not be expected to be found in position.

The signals given below indicate that the lightvessels mentioned against them are not at their stations:

1. One ball at the masthead above the yard.....Læsö Trindel.
2. Two balls at eastern yardarm.....East Flat.
3. One ball at the quarter, eastern yardarm.....Anholt Knob.
4. Two balls at western yardarm.....Læsö Channel.
5. One ball at the quarter, western yardarm.....Lightbuoys.

Night signals.—The following signals are made at an elevation of 62 feet above sea level, from an auxiliary station, north of the new lighthouse, indicating that the lightvessels mentioned are not at the stations:

A fixed red light.....Læsö Channel.
A fixed green light.....Læsö Trindel.
A fixed white light.....Both the above lightvessels.

The red and green lights should be seen from 5 and the white light from 9 miles.

Note.—Signals of a similar character are made at Hirshals Lighthouse southwestward of the Skaw, the only difference being that No. 5 by day and No. 1 by night denote that the Skaw Lightvessel is not in position.

Anholt.—A fixed white light from the eastern side of Anholt Island light (See Light List) denotes that Anholt Knob Lightvessel is not in station.

Fornæs—Ice.—The day signals concerning ice are made at Fornæs, Sejrö, and Kjelsnor, from small houses erected for the purpose, and consists of black triangles placed on the seaward wall, which is whitened. More than one signal may be made at the same time.

When signals are made by the means of triangles, it will be noticed that those respecting ice have the apex of the triangle pointing toward the corner, and in the case of those concerning lightvessels that the apex points toward the center of the square, therefore in those places where ice and lightvessel signals are both made by triangles, if a signal for ice and one for a lightvessel be made in one corner a square is formed.

The day signals at Fornæs are as follows:

1. Triangle, left upper corner.....Ice in north entrance to the sound.
2. Triangle, right upper corner.....Ice in north entrance to the Great Belt.
3. Triangle, left lower corner.....Ice in Læsö Channel.
4. Triangle, right lower corner.....Ice in Aarhus Bay.

Fornæs—Lightvessels.—The day signals at Fornæs, Sejrö, and Kjelsnor, for the lightvessels mentioned below not being in station are made by triangles, placed on the same houses from which the ice signals are made, and the signals at Fornæs are as follows:

(*a*) Triangle, left upper corner.....Schultz's Ground.
(*b*) Triangle, right upper corner.....Læsö Channel.
(*c*) Triangle, left lower corner.....Lightbuoys.
(*d*) Triangle, right lower corner.....Lappe Ground.

Sejrö and Kjelsnor—Ice.—The signification of the ice signals made at Fornæs, Sejrö, and Kjelsnor is as follows:

	Sejrö.	Kjelsnor.
1.	Ice in Langelands Belt	Ice in north entrance to Great Belt.
2.	Ice in West Channel, Great Belt	Ice in West Channel, Great Belt.
3.	Ice in East Channel, Great Belt	Ice in East Channel, Great Belt.
4.	Ice in East Channel of Kattegat	Ice between Gjedser Point and Darsser Ort.

Night signals.—The night signals are made by a fixed red placed in center of square as for day signals and one or more fixed white lights, placed with reference to it in the corners of the square as follows:

1. White light above and to left of red light.
2. White light above and to right of red light.
3. White light below and to left of red light.
4. White light below and to right of red light.

The numbers have the same signification as those for the day signals.

Lightvessels.—At Sejrö and Kjelsnor the letters, referring to the signals at Fornæs, denote that the following lightvessels and lightbuoys are not in position:

Letter.	Sejrö.	Kjelsnor.
a	Schultzs Ground	Schultzs Ground.
b	Anholt Knob	Læso Channel.
c	Lightbuoys	Lightbuoys.
d	Læso Trindel	Gjedser Reef.

Night signals.—The night signals are made by lights on the walls of the houses, in the same manner as in the ice signals, a fixed red light occupying the center, and fixed white lights placed in the corners, forming combinations with it. As given above for night ice signals. The letters denote the same as in the day signals, and correspond to the numbers 1, 2, 3, 4, as described above for ice signals and more than one signal may be made at the same time.

Helsingör—Ice.—The ice signals at Helsingör, made by the means of white shutters placed in front of one or more of the windows of the pilot's house, situated on the south mole, are as follows:

(*a*) White shutter before north, or right-hand upper window. — Ice in the eastern fairway of the Kattegat.

(*b*) White shutter before north, or right-hand lower window. — Ice in Læsö Channel.

(*c*) White shutter before south, or left-hand upper window. — Ice in the northern entrance to the Great Belt.

(*d*) White shutter before south, or left-hand lower window. — Ice in the southern entrance to the Sound.

More than one signal may be made at the same time.

Lightvessels.—The day signals for light signals at Vinga are the yard of the time-signal staff on the pilot's house at Helsingör, are as follows:

(*a*) Cone, apex upward.....The Skaw.
(*b*) Cone, apex down.....Læsö Trindel.
(*c*) Two cones, point together.....Anholt Knob.
(*d*) Ball.....Drodgen.

Sprogö—Ice.—Day signals respecting ice are made from the lighthouse by hoisting a ball to a horizontal staff, on either the east or west sides of the lighthouse gallery. The significations are as follows:

Ball on east side.....Ice in East Channel, Great Belt.
Ball on west side.....Ice in West Channel, Great Belt.

Swedish ice signals—Vinga.—A white frame is fixed on the western side of Vinga red beacon, about midway of its height, on the corners of which are placed white squares, or tablets, each forming a signal, while a white disk, exhibited above the frame, forms another signal. Three oblong tablets displayed below the frame also form additional signals. The disk is No. 1, and the numbers of the squares are as shown below, the oblong tablets being lettered a, b, and c, commencing from the left; more than one signal may be made at the same time.

The signals are as follows:

1. Disk.....Ice in the eastern fairway of Kattegat.
2. Square, left upper corner.....Ice in the Sound.
3. Square, light upper corner.....Ice in Kungsbacka Fiord.
4. Square, left lower corner.....Ice at Varberg.
5. Square, right lower corner.....Ice at Marstrand.

(*a*) Oblong, north side of beacon.....Ice in Hälskärsleden
(*b*) Oblong, middle of beacon.....Ice in the fairway near Vitten.
(*c*) Oblong, south side of beacon.....Ice south of Vinga.

Lightvessels.—The day signals for light signals at Vinga are made by white balls and cones, painted white with a black band, hoisted on a yard, the mast of which is situated about 65 yards southward of the semaphore.

The lightvessels which are not in position are placed against the numbers of the signals.

1. One ball at masthead, above the yard.....Læso Trindel
2. Two balls vertical, at north yardarm.....Lappe Ground.
3. One ball midway on the north yardarm.....Anholt Knob.
4. Two cones, points touching, south yardarm.....Svinbådan.
5. Cone, point downward, ball below midway on the south yardarm.....The Skaw.
6. Three balls vertical, south yardarm.....Flint Channel lightvessels.
7. Cone, point upwards, under ball, north yardarm.....Fladen lightvessel.

Kullen—Ice.—The ice-signal station at Kullen is near a flagstaff close to the southward of Kullen high lighthouse, and the day sig-

nals are made by means of black triangular plates with base toward center of the square, placed at the corners of a white board, which faces westward.

The ice signals at Kullen are:

1. Triangle, left upper corner____Ice in the eastern fairway of the Kattegat.
2. Triangle, right upper corner___Ice in the northern entrance to the Sound.

Lightvessels.—The day signals for lightvessels at Kullen, made at the same place where ice signals are exhibited, by black triangular plates, with apex toward the center of the square, placed in the corners of a white board, are as follows:

(*a*) Triangle, left upper corner_____Flint Rännan lightvessels.
(*b*) Triangle, right upper corner_____Lappegrund.
(*c*) Triangle, left lower corner_____Svinbådan.
(*d*) Triangle, right lower corner_____Fladen.

Night signals.—The night signals are made with a fixed red light in the center, and fixed white light placed in the corners, as follows, the letters having the same signification as in the day signals:

(*a*) White light above and to left of red light.
(*b*) White light above and to right of red light.
(*c*) White light below and to left of red light.
(*d*) White light below and to right of red light.

One or more signals may be made.

Helsingborg—Ice.—The ice-signal station at Helsingborg is near the pilot station, on the north mole, and northward of the harbor pavilion; the board, facing westward, shows the same numbers as that at Kullen, the signals being as below:

1. Triangle, left upper corner_____Ice in the eastern fairway of the Kattegat.
2. Triangle, right upper corner____Ice eastward of Hven.
3. Triangle, left lower corner_____Ice westward of Hven.
4. Triangle, right lower corner____Ice in Flint Channel.

Lightvessels.—The lightvessel signals at Helsingborg are made by a similar means to those at Kullen, the signal station being at the same place where the ice signals are made.

The signals, with the lightvessels indicated by them, are as follows:

(*a*) Triangle, left upper corner_____Flint Channel lightvessel.
(*b*) Triangle, right upper corner_____Falsterboref.
(*c*) Triangle, left lower corner_____Svinbådan.
(*d*) Triangle, right lower corner_____Fladen.

Night signals.—The arrangement of the lights is the same as at Kullen, and the night signals refer to the same lightvessels as those made by day.

Falsterbo Point—Ice.—The ice signals at Falsterbo Point are made by the means of black balls and a cone, hoisted on a signal mast southwestward of the lighthouse, the yard having a north and south direction; the numbers of the signals are as shown at the side, and the signals are as follows:

1. Ball, north yardarm.....Ice in Flint Channel.
2. Ball, at masthead.....Ice in Drogden Channel.
3. Ball, south yardarm.....Ice eastward of Hven Island.
4. Ball, on the mast below yard.....Ice westward of Hven Island.
5. Cone inverted, on mast below yard...Ice in southern entrance to the Great Belt.

Lightvessels.—The day signals at Falsterbo Point respecting lightvessels, made by means of a black ball hoisted on the ends of spars, placed horizontally, in a north and south direction, on the sides of the light tower, below the lantern, are as follows:

(*a*) Ball on the north side.....Flint Channel lightvessels withdrawn.
(*b*) Ball on the south side.....Drogden withdrawn.

Night signals.—The night signals, made by means of a fixed red light, placed on the roof of the lower part of the tower, and either on the north or the south side, are as follows:

(*a*) Fixed red light, north side.....Flint Channel lightvessels withdrawn.
(*b*) Fixed red light, south side.....Drogden withdrawn.

Ice information.—Information regarding ice conditions in the entrances to the principal harbors on the Swedish coast, and in certain channels leading to the Baltic, is posted up daily during winter at the undermentioned places:

Göteborg.—At the pilot captain's office.

Malmö.—At the pilot station and at the harbor captain's office.

Denmark—Copenhagen.—Daily at noon and 10 p. m. from the wireless telegraph station.

Germany.—From the commencement to the close of the season when ice may be expected, official telegraph reports of the ice conditions at places on the German coast, and also of the same in Danish waters, will be issued daily, and these reports can be obtained from post and telegraph offices.

Icebreakers.—Icebreakers, or vessels acting as such, are kept at work during the winter at the following ports:

Aarhus.—A tug is used which, under ordinary circumstances, keeps the harbor open.

Horsens.—A local steam vessel, constructed to work as an icebreaker, gives satisfactory results.

Odense.—One powerful icebreaker.

Helsingör.—There is a regular icebreaker, and the ferryboats running between Helsingör and Helsingborg, are also used to keep the channel open.

Copenhagen.—Three icebreakers are for use at Copenhagen.

Korsör.—There are two icebreakers.

Nyborg.—A powerful icebreaker is for use in the Great Belt, but the port has not been closed since 1885.

Svendborg.—There is no special icebreaker at this port, but three other vessels are available and are used when necessary.

Buoyage—Swedish system.—The Swedish system of buoyage consists of plain, broom, cross, and ball perches, or beacons. Plain perches have their upper half painted white and the lower half painted black.

Broom perches, or beacons, are painted red and are surmounted by brooms, either upturned or down turned; they may be also furnished with balls.

Cross perches, or beacons, are painted black and red in horizontal bands, which are about 18 inches in breadth; they are surmounted by a cross painted one-half black and one-half red, and balls are sometimes employed.

Balls, of which one or more may be used, are either constructed of strips of wood fastened to the perch or of basketwork. As a rule all perches, or beacons, painted red will be furnished with one or more brooms, although perches with other topmarks may be met with, but are extremely rare.

Light, bell, and whistle buoys mark certain dangers and are of various shapes. The first remain out all the year, unless otherwise stated, or their removal is necessitated through ice, and the two last are only removed for the latter reason. When these are withdrawn their place is taken by plain perches, or winter beacons.

Iron or wooden buoys are also employed, one of the latter floating just level with the surface, and surmounted by a pyramid, formed of strips of wood, but this is only employed in inner channels.

The general rule regarding the buoyage of channels (not including shoals or banks that extend in other directions than toward the fairway), is that perches or beacons on the north or the east side are painted red and surmounted by a broom, while the perches or beacons on the south or west sides are plain or painted black.

But as few channels maintain the same direction throughout their entire length, assumed directions, for the purposes of buoyage, are given below for some of the principal fairways:

From—	To—	Direction.
Sea	Marstrand	West-east.
Sea	Fotö Sound	West-east.
Sea, by Buskär	Stora or Lilla Kalfsund	South-north.
Sea, north or south of Vinga	Göteborg	West-east.
Sea, by Vinga	Känsö, Vargöhåla	West-east.
Sea, by Tistlarne	Varö	South-north.
Sea, east of Nidingen	Through Malösund	South-north.
Sea, east of Nidingen	Malö hamn	South-north.
Sea	Kungsbacka Roadstead	South-north.
Sea	Varberg	West-east.
Sea	Falkenberg	South-north.
Sea	Halmstad	South-north.
Sea	Engelholm	West-east.
Sea	Höganäs	West-east.
Sea	Helsingborg	West-east.
Sea	Landskrona	West-east.
Sea	Malmö	North-south.
Sea	Limhamn	West-east.
Falsterbo lightvessel	Sea, north of Helsingborg, east or west of Bredgrund through Flint Channel.	South-north.

Shoals or banks in the open sea, outside the skärgård and inner channels, are beaconed as follows, and may be surmounted by balls, or other top marks, or be without such:

The northern side of a shoal or bank, by perches or beacons, painted entirely black.

The eastern side of a shoal or bank, by perches or beacons, painted black, with a white band, 3¼ feet broad in the center.

The southern side of a shoal or bank, by perches or beacons, painted red and surmounted by one or more upturned brooms.

The western side of a shoal or bank, by perches or beacons, painted red and surmounted by one or more down-turned brooms.

Fixed sea marks.—The fixed sea marks consist of beacons, cairns, pole, or stake beacons and fixed perches.

Beacons are usually towers or similar buildings.

Cairns are built of stone or concrete, and are generally conical shaped.

Pole or stake beacons usually consist of a pole with stays, with boards sometimes fixed to either; the top marks may be of different forms.

Fixed perches mark banks or rocks, partly above water, and are either red with a triangular top mark of strips of wood, with a down-turned point, and surmounted by a broom, answering to a broom or red ball beacon; black, with triangular top mark of strips of wood, with point upturned, answering to a plain or black ball beacon, or else black and red, with two triangular top marks of similar make, with points turned toward each other, and the upper painted red and lower black; this corresponds to a cross or black and red ball beacon.

When lightvessels, buoys, and such beacons as are liable to injury are withdrawn at the close of navigation, in consequence of ice, they are, in some localities, replaced by temporary perches, and at the opening of navigation in the spring they are replaced; those marking main fairways for shipping being first laid out.

Marking of wrecks.—In accordance with an arrangement come to between Sweden and Denmark wrecks will be marked in the following manner:

Wreck-marking vessel.—A wreck-marking vessel shall show:

By day.—Three green balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest to the wreck.

By night.—Three green fixed lights similarly arranged, but not the ordinary riding light.

During foggy weather, by day or night, a bell will be rung for about 10 seconds at intervals of not more than two minutes. When the wreck-marking vessel is anchored in a direction between north

and east from the wreck the sounding of the bell will consist of one peal followed after a short interval by two peals (double strokes), and a vessel should pass northward and eastward of her. When the vessel is anchored in a direction between south and west from the wreck the bell will give one peal followed after a short interval by another peal (single stroke), and a vessel should pass southward and westward of her.

A gun will be fired at short intervals from the wreck-marking vessel should a vessel be observed to be steering such a course that she may come into collison with the wreck.

The sides of a wreck-marking vessel shall not, if it can be avoided, be painted red.

Wreck buoys.—A wreck lightbuoy is painted green, and shows a flashing green light or a group flashing green light with one or two short flashes.

A wreck buoy is painted green, and carries one or two green flags on a staff.

A wreck mark will be painted green and furnished with one or two green flags.

A wreck lightbuoy showing two green flashes, or a wreck buoy with two flags, is anchored in a direction between north and east from the wreck, and should therefore be passed to the northward and eastward.

A wreck lightbuoy, showing a single green flash, is anchored in a direction between south and west from the wreck, and should therefore be passed to the southward and westward.

Signals with regard to wrecks.—Signals will be made from certain lightvessels and lighthouses concerning wrecks in the Sound which are considered to be dangerous to navigation. These lightvessels and lighthouses are as follows:

On the Swedish side, Falsterboref and Oskarsgrundet lightvessels and Kullen lighthouse.

On the Danish side, Stevns Cliff lighthouse, Drogden lightvessel, and Helsingor.

Signals.	Signification.
Two green balls by day, or two fixed green lights by night.	Wreck in northern entrance to Sound, or in the Sound north of the parallel of Middle Ground fort. Navigate with caution.
Three green balls by day or three fixed green lights by night.	Wreck in the Sound south of the parallel of Middle Ground fort. Navigate with caution.

Danish system.—The following is the system of buoyage in Danish waters:

The starboard side of a fairway is that which is on the starboard hand, and the port side is that on the port hand of a vessel when entering.

(1*a*) **Main channels.**—In the main channels the shapes and the colors of the buoys, as well as the top marks, indicate the side of the fairway on which they are placed.

(*b*) The starboard side of the channel is marked by conical buoys, painted red; when top marks are used, they are either one, two, or three up-turned brooms upon a red staff.

(*c*) The port side of the channel is marked by can buoys, painted white; when top marks are used they are either one, two, or three down-turned brooms upon a white staff.

(*d*) Middle grounds, or dangers that may be passed on either side, are marked by conical buoys, painted red and white in stripes. When a top mark is used it is a ball, striped red and white, on a staff, also striped red and white.

Similar buoys may be used as mid-fairway guides to the entrance to a channel from seaward.

(*e*) Light and whistlebuoys, as regards color and top marks (if they have any), and bellbuoys, with regard to shape, are in accordance with the system given above.

(2*a*) **Small channels.**—In the smaller channels the color and the top marks (if the latter are carried) of poles indicate the side of the channel on which they are placed, thus:

(*b*) The starboard side of the channel is marked by poles, painted red, and surmounted by one or two brooms.

(*c*) The port side of the channel is marked by poles, painted white, and surmounted by one or two straw wisps.

(*d*) Middle grounds and dangers that may be passed on either side are marked by poles, painted red and white in stripes, and surmounted by a broom over a straw wisp.

(*e*) Mid-fairway marks are painted red and white in stripes, and surmounted by a red and white striped ball.

(3*a*) **Application of the system.**—In the Kattegat the Sound, the Great Belt, and the Little Belt, a vessel is considered to be entering the channel when proceeding from the North Sea toward a Danish harbor or to the Baltic.

(*b*) In closed fiords and entrances to a port or roadstead, a vessel is considered to be entering when coming from seaward.

(*c*) Lim fiord, Smaalands Farvandet, and the fairway, southward of Fyen, are each considered as two closed fiords, the closing or meeting points, respectively, being Logstör, Masnedö, and Svendborg-Marstal.

(4) **Winter buoyage.**—In the winter large bellbuoys and can buoys are replaced by smaller buoys of similar type, top mark, and color, and a few buoys are withdrawn.

When ice compels the withdrawal of lightbuoys or whistlebuoys they are replaced by spar buoys or by nun buoys.

When the word "broom" is used by itself it signifies an upturned broom.

Marking of wrecks.—The system is in all respects similar to that adopted by Sweden, given above, for wrecks in Kattegat and Sound.

German system.—The following uniform system of buoyage and beaconage, for the purpose of marking the channels and shoals, is in force on the German coasts:

The term starboard hand denotes that side of a channel which lies on the right or starboard side of the vessel when entering from seaward, and the term port hand, the left, or port hand under the same circumstances.

Where a channel connects two parts of the sea, or two sheets of water separated by banks, the starboard hand denotes that side which lies on the right hand when entering from the westward, and the port hand that on the left. The term from the westward is taken to include the whole of the western semicircle, from north (true), inclusive, to south.

Buoyage.—Buoys surmounted by a beacon-shaped structure, bell-buoys, lightbuoys, and automatic whistlebuoys are termed "bakentonnen" (beacon buoys).

Approach buoys are painted in a color corresponding to the side on which they should be passed.

Top marks need not, with exception of wreck and quarantine buoys, correspond with the color of the beacon or buoy.

Channel buoys are marked with the name or number in white and are numbered from seaward. Intermediate buoys, when introduced into the buoyage of a channel, have, when starboard hand buoys, the marking A1, A2, or B1, B2, etc., and if port hand buoys, the marking 1a, 1b, or 2a, 2b, etc. Channels of a considerable length may be subdivided and each section marked with a separate series of letters or numbers.

When fixed marks are used the starboard side of the channel will bet marked by beacons each with a spar as top mark; the port side of the channel will be marked by beacons without spars.

The seaward entrances of channels not marked by lightvessels, beacons, or moles have buoys with cagelike superstructure, locally termed "bakentonne," of the same color as the channel buoys, moored in such a position that the nearest channel buoys may be plainly seen from them.

Starboard-hand buoys are spar buoys painted red, or, where several channels are near each other or the water is not deep enough for spar buoys, can buoys painted red may be used.

Port-hand buoys are conical and painted black.

The extremes of shoals extending from the shore, or branching fairways, are marked by buoys or beacons with a cagelike superstructure, locally named "bakentonnen."

The extremes of middle grounds are marked by bakentonnen painted red and black in stripes and surmounted by a cross.

Mid-channel buoys which may be passed on either side are spherical buoys painted red and black in stripes.

Buoys and beacons marking the edges of shoals seaward of channels are painted white and surmounted by two vertically placed triangles, arranged as follows:

(1) When on the northern edge of the shoal the points of both triangles turned upward.

(2) When on the southern edge of the shoal the points of both triangles turned downward.

(3) When on the eastern edge of the shoal the points of both triangles turned away from each other.

(4) When on the western edge of the shoal the points of the triangles turned toward each other.

(5) When a shoal is so small that it can be marked by a single buoy or beacon and passed on any side the buoy or beacon is painted black and white in stripes and surmounted by a cylinder.

The name of a shoal, either full or abbreviated, is painted in black letters on buoys and beacons that mark it, and buoys and beacons on the edges of shoals have the letters N., S., O., or W. painted on them in black letters to correspond with the side of the shoal on which they are placed.

When beacons are used they are painted red on the starboard and black on the port hand.

Beacons consisting of a group of logs are named Dalben (Duc d'Alben), those on the starboard side having a pole as a top mark.

Perches are beacons consisting of single stakes, driven into the ground, and may or may not be surmounted by branches or brooms; they are used to mark the starboard sides of small channels.

Pricken consist of young trees with branches, or only branches of trees driven into the ground; they are used to mark the port sides of small channels.

Wreck marking.—Lightvessels marking wrecks are painted green, and have the word "Wreck" in white letters on each side; they do not show anchor lights.

Lightbuoys marking wrecks exhibit a flashing or occulting green light.

When the wreck itself is marked it will be by a green light, placed vertically 5 feet above a white one.

Wreck-marking buoys are either can, conical, or barrel buoys, painted green, with the word "Wreck" in white letters. The top-

marks on wreck buoys are similar to those used for marking shoals seaward of channels.

Buoys marking the position of submarine telegraph cables are spherical buoys, painted green, with the word "Telegraph" or the letter "T" painted on them in white.

Buoys marking the limits of quarantine grounds are either can, conical, or barrel buoys, painted yellow.

Buoys marking firing, mining, and torpedo trial grounds are barrel buoys, painted yellow, and surmounted by a small red flag.

Buoys moored in the fairway for warning purposes (whistle buoys as advanced fog signal stations, etc.), which may be passed on either side, are painted in black and white checkers, and marked with the name of the place nearest to them on the chart. This does not refer to approach buoys, wreck buoys, mid-channel, or middle ground buoys.

Buoys and beacons for mooring purposes, or to define the boundaries of a roadstead, or for bearing marks, are so constructed in shape, color, and topmarks as to prevent their being mistaken for any other buoys or beacons in their vicinity.

Salvage vessels—Marine works.—The following distinguishing marks are shown by salvage vessels and on marine works:

By day: A cylinder, painted red.

By night: A white, a red, and a fixed white light, placed vertically.

Pilots—Sweden.—The Swedish pilot service is divided into eight districts, and governed by a board, consisting of a director general, or president, and three members, each district having a pilot captain (lotskapten), who is usually a Swedish naval officer; two of the districts include the west coast, viz, Göteborg and Malmö.

Swedish pilots are competent to pilot all vessels up to the draft which can navigate the fairways in their respective districts.

Steering commands.—Germany and Sweden have adopted the French system, viz, "starboard" means that the ship's head is to go to starboard, and "port" means that the ship's head is to go to port.

Regulations.—Pilotage is compulsory in Swedish fairways for vessels in the service of a foreign State which are not men-of-war, and for other vessels arriving from or leaving for abroad, with the following exceptions:

(*a*) Vessels whose dutiable displacement does not exceed 40 tons, provided they are not towing vessels subject to the obligation to employ a pilot.

(*b*) Vessels proceeding between Swedish and foreign ports eastward of a line between Lindesnæs and Hantsholm.

(*c*) Vessels which, on account of victualing, coaling, death on board, or stress of weather, run into, and afterwards proceed direct to sea from, a Swedish port or roadstead without in any case land-

ing other passengers than those who are ill or dead on board, or taking on board passengers, or discharging cargo, or loading other goods than provisions, coal, or maritime necessaries for the vessel's own use.

For a vessel in the service of a foreign State, which is not a man-of-war, a licensed pilot shall be employed in all the pilots' fairways included in the current schedule of fairways, and in all other fairways known by the pilot situated within the archipelago, which are passed through.

There are separate decrees as to the pilotage of foreign men-of-war.

When a vessel which is not in the service of a foreign State arrives from, or leaves for, abroad, a licensed pilot shall be employed to conduct the vessel in all the pilots' fairways included in the current schedule of fairways, and in all other fairways known by the pilot situated within the archipelago, which are passed through. In the former case, from the open sea or from the State boundary to the first place of discharge or of lading, or of calling for orders, without regard to whether the vessel was destined to or entered at another Swedish place; and, in the latter case, from the last place of lading, or, if the vessel is in ballast, from the last place of departure to the open sea or the State boundary.

The Skagerrak, Kattegat, Sound, the Baltic, and Kalmar Sound south of Grimskär and north of Skägganäs, the Åland Sea, and the Gulf of Bothnia are regarded as open sea.

West pilot district.—This district includes the following pilot stations and attendance places: Marstrand, Hättan, and Kalfsund; Brännö, Vrångo, Tistlarne, Mönster, and Falkenberg. Swedish pilot boats cruise off the Skaw with pilots for Swedish ports.

South district.—Torekov, Höganäs, Råå, Landskrona, and Limhamn.

The following are pilot stations and posts of observation: Halmstad and Torekov; between Svinbådan Lightvessel and Kullen, from a pilot steamer or cutter; Malmö; between Drogden and Falsterboref Lightvessels, from a steamer or cutter; Limhamn and Klagshamn.

At the most important stations the boats are decked, and cruise even in bad weather, but where the boats are small vessels should hoist the pilot signal, which at some stations is answered by a black ball, with a white central belt, hoisted at a flagstaff, signifying that a pilot will immediately come out.

Steam pilot vessels, lightvessels, and lighthouse stations fly the national ensign, with a white field in the middle of the yellow cross, having in it an anchor and a star, but pilot boats carry a white and blue flag and also have a red cloth in the mainsail. The latter show an alternating red and white light by night.

If giving directions to a vessel before boarding, the pilot will signal with the pilot flag as follows:

Flag inclined to starboard	Steer more to starboard.
Flag inclined to port	Steer more to port.
Flag held upright	Steady.
Flag waved from side to side	Heave to or stop.

Only Government pilots are allowed to be employed, and if in a case of necessity an unlicensed pilot is taken, it should be only until a Government pilot can be obtained.

Signals.—The following signals, made either separately or together, shall be understood as signals for summoning a Swedish pilot:

By day.—(*a*) The national flag, hoisted at the fore.

(*b*) The pilotage signal "P. T." of the international code.

(*c*) The international signal "S," with or without the distinguishing pendant above it.

(*d*) A distant signal, consisting of a cone, point upward, with two balls, or something of a similar form, above it.

By night.—(*a*) A blue light, shown every 15 minutes.

(*b*) A bright white light or flare, at short intervals just above the bulwarks, about a minute at a time.

(*c*) The light specified under (*a*) or (*b*), together with a lantern with a bright white light placed on or near to the bow as is possible, lower than the side lanterns, and on that side of the vessel which can be visible to the pilots. This lantern with bright white light should be shown uninterruptedly.

If, in consequence of thick weather or other causes, the above signals for summoning a pilot presumably can not be sighted from the pilot station or pilot boat, attention should be called thereto by means of the steam whistle or foghorn, with which there should be given alternately short and long notes immediately following each other, or series of one long and three short notes.

Swedish pilotage steamers when employed for purposes other than pilotage show the following flag, in addition to the Swedish colors, viz, a burgee, one-third of it, nearest the hoist, white, bearing an anchor and royal crown in gold, the remaining two-thirds is of the blue of the national flag. The length of the burgee is twice its height. The steamer's funnel bears an anchor and rope surmounted by a star.

Denmark.—The national flag is hoisted at the stern of Danish pilot steamers, and when able to provide a pilot, they hoist a flag with two horizontal bands, the upper white and lower red, at the masthead; this flag is also shown by lightvessels or other stationary vessels, when in a position to send a pilot.

The principal cruising grounds of the Danish pilots are off the Skaw; near the northern entrance to the Sound, or in the southern

part of Drogden Channel, and at the first, it is possible to obtain a pilot for almost any port.

At Drogden Lightvessel the pilots use a motor boat for boarding, and pilot vessels between Falsterbo and Kullen, through all the channels and to every part of the sound; they have the exclusive right for Drogden Channel.

The same flag as mentioned above, fixed to a staff, is used by small boats when able to supply a pilot, but when unable to do so, only the national flag is shown; sailing vessels of pilots have a red cloth in the middle of the main sail.

Pilots for Danish ports can be obtained at the Skaw, and vessels proceeding from the Skaw through the Kattegat and Great Belt to Albuen, Gulstav, Gjedser, and Bornholm may obtain pilots at Frederikshavn, Hirsholm, Nyborg, Helsingör, and Fredericia. Those desiring to pass through the sound should employ a pilot from Helsingör, and those wishing to proceed through the Little Belt should obtain a pilot at Fredericia.

The signals for a Danish pilot are the same as those already given for Sweden.

The following concessions have recently been made as regards compulsory pilotage:

1. All vessels (ships, barges, lighters, etc.), are freed from compulsory pilotage when being towed by a tug in the following cases:

(*a*) When moving from one anchorage or mooring place to another in the same harbor.

(*b*) When towed by a tug the property of their owner either into or out of their home port.

2. (*a*) When sailing vessels have called for a pilot the vessel towing only pays pilotage when a pilot is required for its own guidance.

(*b*) Sailing vessels of less than 100 tons register, when being towed, are exempt from compulsory pilotage except in certain channels where they are subject to compulsory pilotage.

3. When pilots are not used in Grön Sound for pilotage of steamers, lighters, or barges in tow, and guaranties as directed by the pilotage regulations have been given, only two-thirds of the pilotage will be chargeable.

Germany.—German pilots meet vessels off the ports if the weather permits, but if the boats are unable to reach the vessel, and instructions are given for their guidance, they will be the same as those already given for Swedish pilots; only a staff, or arm, will be used instead of a flag.

German steam pilot vessels, in addition to their navigating lights, carry a red light, visible all around the horizon, 8 feet below the masthead, or anchor, light.

Lights—Swedish.—Except when the area over which the light shows is not navigable on account of the presence of ice or when it is stated to the contrary in the Light List, the Swedish lights burn from immediately after sunset until sunrise, and all the year round.

Lights in the inner channels are usually unwatched, and as some cause may prevent them from being lighted, great caution is necessary when navigating by them.

The navigable fairways are generally covered by sectors of white light, having when steering for them a green light on the starboard and a red light on the port hand, but it sometimes happens that the white sector may be an arc of only two or three degrees, so that great care is necessary to keep as near as possible on the center line of the sector, the colored lights on either side showing over shoal water.

The above remarks also apply to Danish lights.

Lightvessels—Sweden.—The Swedish lightvessels are painted red, with the name in white letters on each side, and when one is replaced by a reserve lightvessel it is also painted the same color, but has the word "Reserv" in white letters on the sides.

By day the vessels carry skeleton balls, painted red, the number hoisted corresponding to the number of lights exhibited, but if driven from their stations, these daymarks are struck. The lightvessels within the area covered by this book do not hoist an anchor light to give any indication of the direction in which they are heading.

A gun is fired to warn any vessel seen standing into danger.

Denmark.—With the exception of Kalleboer, Korsör, and Gjedser Harbor all Danish lightvessels are painted red, with a white stripe running horizontally along each side and a vertical stripe amidships, forming a cross; they have one mast amidships and a jigger mast aft, a red ball being hoisted at the masthead of the former.

When not in position, the flags Z.K.C. ("Incorrect") will be hoisted and the ball struck, if possible; by night the white anchor light, which the vessels hoist, will be the only one shown.

When a lightvessel is fitted with a fog signal a hand foghorn is used in the event of it being disabled.

Should a vessel be observed to be standing into danger a gun will be fired and the flags J.D. of the International Code hoisted.

Germany.—German lightvessels are painted red with the name on each side in white letters and by day carry at the masthead a number of balls corresponding to the number of lights exhibited by the vessel.

When out of position a large black, or dark, flag is hoisted by day, and when practicable the daymarks are lowered; at night only the white riding light, which all these vessels display, will be shown.

Signal stations—Swedish.—Vinga and Helsingborg are signal and telegraph stations, and vessels can communicate with them from sunrise to sunset by the International Code; vessels passing near the Swedish side in the vicinity of the latter station and showing the national flag and their number are reported free of charge.

The names of vessels reported from Vinga are published in a report issued three times daily at Göteborg between the months of March and October and twice daily at the other period of the year; these reports are posted up at several places in the town. From the signal station at Helsingborg vessels are reported to Lloyd's agent in the town, and their names are published in certain newspapers.

When arrangements have previously been made are regards payment for the service the stations will, if requested, furnish information regarding the state of the ice and as to any lightvessels that may be withdrawn, and will also forward requests for pilots, tugs, etc.; also, under the same conditions, vessels will be reported by telegraph to any given address.

Danish.—The Skaw, Fornæs, and Kronborg Point are the three signal stations within the limits of this volume, where messages by the International Code are received and dispatched from sunrise to sunset.

The state of the ice, lightvessels, etc., is reported from these stations. Passing vessels showing the signal letters of their names are reported by telegraph without charge, at noon, every day at the exchange at Copenhagen, and in Aarhus, and the communication is published the same evening in several papers. The intelligence is also communicated to the Hamburg Exchange and to London for publication.

German.—The following are the State signal stations established on the coasts of Germany, in communicating with which the International Code should be used:

Schleimünde, Bülk, Westermarkelsdorf, Dahmeshöved, Pelzerhaken, Travemünde, Buk Point, Warnemünde, Darsser Ort, and Cape Arkona.

Submarine telegraph cables.—Telegraph cables connect the Skaw and Vinga, Möeu and Bornholm, and Cape Arkona with Shaftens Head, in Sweden, and cables are also laid across several of the fiords and the channels mentioned herein; these will be noticed under the headings of the various places.

Beacons.—Submarine telegraph or telephone cables in Danish waters are marked by beacons, painted red and white, in horizontal bands.

The rear beacon is surmounted by a red disk with a narrow white border, placed over a white diamond shape, with a narrow red border; if lighted, a red fixed light over a white fixed light is shown.

The front beacon is surmounted by a red disk with a narrow white border, and, if lighted, a fixed red light will be shown.

Radiotelegraph stations—Sweden.—There is a radiotelegraph station at Göteborg.

Denmark.—Radiotelegraph stations are established at Copenhagen, at Gjedser Harbor, at Gjedser lightvessel, and at Drogden lightvessel.

Germany.—The German stations, which are on the Telefunken system, and the property of the German naval authorities, are at Bulk Point and Marienleuchte; they are open day and night, for public use, for all systems.

German lightvessels only communicate by wireless telegraphy with vessels at sea on urgent matters, such as queries regarding buoys, lights, obstructions, currents, storm warnings, etc.

Lloyd's signal stations.—The Lloyd's signal stations belonging to the Swedish Government are at Vinga and Helsingborg; to the Danish Government at the Skaw, Fornæs, and Helsingör; and to Germany at Holtenau at the Baltic entrance to the Kaiser Wilhelm Canal.

Submarine fog bells have been placed at certain lightvessels, and those desirous of becoming acquainted with the working of them can have practice signals made, at other times than in foggy weather; the vessel requiring them must hoist a white flag with a yellow ball, and the lightvessel will display a similar flag during the continuance of the practice signals. It is requested that the result of observations may be reported to the Marine Works office, Flensburg.

Depth signals—German ports.—The following signals indicate the depth of water at the entrance of the ports of the German coast in the Baltic:

No. 1. A diamond where mast and yard cross each other, 6½ feet.

No. 2. A diamond where mast and yard cross each other, with another diamond over it, 9¾ feet.

No. 3. A diamond where mast and yard cross each other, with another diamond under it, 13 feet.

No. 4. A cylinder, horizontal, where mast and yard cross each other, 16¼ feet.

No. 5. A cylinder, horizontal, where mast and yard cross each other, with diamond over it, 19½ feet.

No. 6. A cylinder, horizontal, where mast and yard cross each other, with diamond under it, 22¾ feet.

No. 7. A cylinder, horizontal, where mast and yard cross each other, with another cylinder, horizontal over it, 26¼ feet.

No. 8. A cylinder, horizontal, where mast and yard cross each other, with another cylinder, horizontal, under it, 29½ feet.

No. 9. A diamond, on right yardarm, as seen from sea, 4 inches.

No. 10. A cylinder, horizontal, on the right yardarm, as seen from sea, 1¾ feet.

No. 11. A red pennant on the right yardarm, as seen from sea, 2 inches.

No. 12. A red pennant over a white flag with red cross on left yardarm as seen from sea, indicates "The water is rising."

No. 13. A white flag with red cross on left yardarm, as seen from sea, indicates "High-water level."

No. 14. A red pennant under a white flag, with red cross on left yardarm, as seen from sea, indicates "The water is falling."

No. 15. A red pennant at top of signal mast indicates "Entrance free."

Steam dredger signals—German.—The following signals are shown by the steam dredgers employed in German coastal waters included in this volume to indicate the side on which vessels may pass:

By day.—A red ball.

By night.—Two lights placed vertically; upper light, red; lower, white.

The signals to indicate the side of a dredger on which vessels may not pass, or the special signals to be shown should a channel be completely closed by a dredger, are in every case decided by the local authorities.

Distress signals—Danish and German.—The following signals are in use by both countries, and a ship in distress and requiring assistance either from the shore or from another ship should use them either collectively or singly:

By day.—(1) A gun fired at intervals of about a minute; or (2) the distress signal "N.C." of the International Code; or (3) the distant signal, consisting of a square signal flag, with a ball or some similar object either above or below it; or (4) a signal, consisting of a cone, point upward, with a ball or some similar object either above or below it; or (5) continued sound on ship's fog whistle or horn.

By night.—(1) A gun fired at intervals of about a minute; or (2) flare-up lights or flames produced by burning tar barrels, oil casks, etc.; or (3) rockets or shells of any kind or color discharged one at a time at short intervals; or (4) continued sound on ship's fog whistle or horn.

Life-saving stations—Sweden.—The following stations are furnished with a lifeboat and a rocket apparatus: Båtfiord, Galtabäck, Stafsinge, Särdal, Halmstad, Torekov, Helsingborg.

A lifeboat is stationed at Häganäs and at Skanör.

There is a rocket apparatus at Engelholm, Engelholm Harbor, Arildsläge, and Arilds Village.

Denmark.—Lifeboats and rocket apparatus is maintained at the following places:

Skagen, Aalbæk, and at the east and west ends of Læso. Lifeboats are stationed at:

Grenen (The Skaw), Jerup, Sæby, Hornex, on the north side of Læso, and Grenaa Havn. Lifeboats are also stationed at Anholt, one being near the lighthouse, and the other near the town.

A rocket apparatus is maintained at Fornæs.

Germany.—The following stations are furnished with a lifeboat and a rocket apparatus:

Travemünde, Poel, Buk Point, Warnemünde, Wustrow, Prerow, Zingst, Dornbusch, Dranske, Putgarden (Cape Arkona).

Lifeboats are stationed at Labö (Kiel Fiord), and at Barhöft.

There is a rocket apparatus at Darsser Ort.

Quarantine.—Känsö Harbor, southward of the entrance to Vinga Sound, and an area in the inner channel, eastward of it, are quarantine stations for Sweden, and Helsingborg is an observation place.

Danish quarantine regulations.—No person, except the officer commanding, is permitted to land from a vessel arriving at a Danish, from a foreign port, until pratique has been granted, and any vessel arriving from an infected port is to hoist a yellow flag (or failing it a white one) at the foremast head, until pratique has been given.

Variation of the compass.—The lines of equal westerly variation run approximately north and south (true) over the Kattegat, and the variation is about 9° 0′ west at the eastern to 11° 0′ west at the western part in 1911, decreasing about 9′ annually.

Foreign ports regulations—Danish ports.—1. Foreign vessels of war are permitted to navigate or anchor in Danish waters without previous notice except in inner waters, Copenhagen Roadsted, and closed waters. See articles 3, 4, 5.

2. Foreign vessels of war are permitted, with the exception mentioned below, to anchor for short visits without previous notice in Danish ports situated directly on the natural shipping routes through the Kattegat, Sound, Great and Little Belts, as well as in the ports of the island of Bornholm.

A stay of more than 48 hours, the visit of a squadron, or a visit to Fredericia, Nyborg, Korsör, or Helsingör, must be notified previously through diplomatic channels.

3. Foreign vessels of war are permitted to anchor or navigate in Danish inner waters, or to anchor in Danish ports other than those mentioned in the second paragraph of article 2, provided that previous notice has been given through diplomatic channels.

Danish inner waters comprise, besides ports, entrances to ports, roadsteads, and bays, the territorial waters situated between and inside islands, islets, and reefs which are not constantly submerged.

The following are specially regarded as inner waters:

(*a*) The fiords on the east coast of Jutland.

(*b*) The waters to the south of Fyen with the following entrances:

The channel between Langeland and Fyen.

The channel between Langeland and the island of Ærö.

The channel between the islands of Ærö and Lyö.

The channel between the islands of Lyö and Fyen.

Odense Fiord.

The waters west and north of the line Hasenöre-Samsö-Endelave-Bjornsknude.

That portion of the Danish territorial waters in the Kattegat, Sound, Great and Little Belts which form the natural shipping routes between the North Sea and Baltic, is not comprised under inner waters.

4. Foreign vessels of war are permitted to navigate or anchor in the port and roadstead of Copenhagen after previous authorization. Previous notification through diplomatic channels is sufficient if it is only required to pass through the Hollænder Deep and Drogden Channels.

For limits of Copenhagen Roadstead see Chapter V.

5. The Danish inner waters mentioned below are considered as closed to foreign vessels of war, and permission to anchor or navigate in them will only be granted to the vessels mentioned in article 6.

(*a*) Ise Fiord and its entrance.

(*b*) Lim Fiord and its entrances.

(*c*) Smaalands Farvandet, with the following entrances:

Agersö Sound.

Omö Sound.

The channel between the islands of Omö and Laaland.

Guldborg Sound.

Grön Sound.

Böge Ström.

6. The restriction of articles 2 (second paragraph), 3, and 4 do not apply:

(*a*) To vessels on board of which are embarked heads of States, or their official representatives, or members of a reigning family, nor to vessels escorting such ships.

(*b*) To vessels in distress.

Searchlights—Danish ports.—Any vessel approaching a defended port in the Kingdom of Denmark when searchlights are being worked, and finding that they interfere with her safe navigation may make use of the following signals, either singly or combined:

(*a*) By flashing lamp, four short flashes followed by one long flash.

(*b*) By whistle, siren, or foghorn, four short blasts followed by one long blast.

Whenever possible both flashing lamp signals and sound signals should be used.

On these signals being made the searchlight will be worked so as to cause the least inconvenience, being either obscured, raised, or its direction altered.

The signals should not be used without real necessity. When vessels are not in the rays of the searchlight it is impossible to know which searchlight is causing the inconvenience.

These signals are designed to assist mariners, and do not render the Government liable in any way.

Foreign men-of-war regulations—Swedish ports.—The following regulations, applicable to this book, are taken from a Royal Decree issued on December 20, 1912:

1. Foreign vessels of war are not, without special permission, allowed to enter the Swedish war harbors of Stockholm, Göteborg, Karlskroma, and Fårö Sound; the proper military authorities in those harbors may, even if permission is not obtained beforehand, allow a ship to enter for the purpose of fishery inspection or scientific work.

Furthermore, as, according to a separate Royal Decree, entry to certain districts in Swedish territorial waters is forbidden to the ships of a belligerent power, so those certain districts shall be regarded as war harbors, and entry thereto by foreign vessels of war is forbidden.

Foreign vessels of war may enter other Swedish ports and roadsteads on condition that not more than three vessels of the same nationality anchor simultaneously in the same port or roadstead, and that their stay does not, without special authority, exceed 14 days, and they shall announce the visit through the diplomatic channel at least 8 days before, if possible.

2. The war harbor district of Göteborg consists of:

The zone within a line drawn from Korshamn on the mainland, going through Inre Leskär Beacon, Torrboskär Beacon, Vinga Light, Yttre Tistlarne Cairn, and the southwestern point of Särö.

3. If, in consequence of diplomatic negotiations or other reasons, permission has been granted to foreign vessels of war to visit a Swedish war harbor, or similar zone, the vessels must select their anchorage in conformity with the regulations issued by the local military authorities.

4. In the event of the King so ordering it, foreign vessels of war are obliged to leave the port or territorial waters and to put to sea

within 6 hours after the order shall have been transmitted by the local military or civil authorities, even if the time granted for the stay, in accordance with paragraph 1, shall not have elapsed.

5 The personnel of a foreign vessel of war may not undertake nautical surveys or soundings in Swedish territorial waters, except such soundings as are necessary for the safety and navigation of the ship.

Landing and shooting practice may not be carried out, nor may an armed force be landed except by special permission.

6. Foreign vessels of war in inner Swedish territorial waters may not take other course than the Government pilot's fairway, and the commander of the vessel, unless otherwise authorized, is obliged to employ competent Swedish pilots. By inner Swedish territorial waters is here understood to mean harbors, entrance to harbors, roadsteads, and creeks, as also waters surrounding islands, rocks, and reefs which are uncovered at low water; also, that in the sound, only recognized harbors and harbor entrances are considered as territorial waters.

The commander of a foreign vessel of war is obliged, when in Swedish territorial waters, to conform to the provisions of the sanitary, pilot, customs, port, and police regulations, of which he is informed by the proper authorities.

7. The regulations contained in paragraph 1 are not in force as regards vessels on which is a head of a State or his official representative, for vessels escorting the same, or for vessels in distress.

8. Special regulations are in force for belligerents' vessels of war entering Swedish harbors, roadsteads, or other Swedish territorial waters.

German coastal waters—Caution.—The German Government has given notice as follows:

1. During maneuvers, regular exercises, or from other causes it may be necessary to make the entrance of vessels into German river mouths and harbors, as also the departure therefrom, dependent upon special conditions, or wholly to prohibit them.

2. In such cases a warning signal will be shown at conspicuous places; it consists of three red balls by day, and at night of three red lights, placed vertically one above the other.

3. The same signals will be shown by patrol vessels which, according to circumstances, also carry the pilot flag.

4. All vessels which wish to enter or leave the German privileged district must, as soon as they observe the above-mentioned signals, viz. three red balls by day, or three red lights by night, fly the pilot flag and await the arrival of the patrol or pilot vessel.

Should the warning signal be made at night, it is recommended to anchor outside the privileged waters or to remain in harbor.

5. On the signal being made or a gun being fired from the patrol vessel, all vessels in sight must stop immediately or heave-to.

6. Vessels are to submit to the request for an examination.

7. The patrol or pilot vessels will give detailed information upon:

(*a*) Whether a special examination service is in force, and where it takes place.

(*b*) Whether, and for how long, the harbor entrance or river mouth is closed.

(*c*) Whether special regulations are in force for the navigation of a certain district.

(*d*) The communication of the requisite information for departing vessels will be given according to circumstances, or the examination be conducted in the harbor itself by the harbor authorities.

(*e*) Anyone offending against this regulation does so at his own danger, and must answer for the damage occasioned.

German harbors.—Not more than three foreign vessels of war are allowed to visit a German port at the same time without permission.

No special permission is required for vessels of war belonging to foreign powers to enter fortified or unfortified German harbors or river mouths or to navigate inland waters, but notice that it is proposed that they do so should be given through the proper diplomatic channels.

Without this having been done such vessels may neither cross the line of fortifications nor remain in any of the roadsteads or harbors unless there should be on board a member or members of a royal family, the President of a Republic, or an ambassador or envoy to the German court, or in the event of such a vessel being in distress.

Permission through a diplomatic channel must be obtained before a foreign vessel of war can pass through the Kaiser Wilhelm Canal.

The right of assigning anchoring billets to foreign warships and of demanding them to shift, should the same become necessary, is solely vested in the commanders in chief of naval stations or the commandant, etc., who is to keep in touch with the customs authorities, so that he may be able to consider the interests of the latter when fixing the anchoring billets.

Vessels of foreign powers are under no obligation to take a pilot when approaching the roadstead or anchorage, but within the fortress boundaries of a German port they are subject to the police regulations.

Should the harbor police regulations be disregarded by a foreign warship the captain of the ship is in the first place to have his attention drawn thereto, and the explicit observance of these regulations is to be insisted on. Should this method fail to secure compliance, then, if delay is dangerous, the competent authority shall take steps accord-

ing to his own judgment; in other cases, however, the directions of the superior authority are to be sought.

When a foreign warship or squadron crosses the fortress boundaries from seaward an officer is to be sent by the commander in chief of the station or the commandant, etc., to greet it. Should the place not belong to the Imperial navy ports this officer is to be accompanied by the chief pilot or harbor master.

This officer is to give the captain of the ship or squadron official notification as to whether the same may enter and how long they may remain in the roadstead or harbor. When desirable the officer, the chief pilot accompanying him, or the harbor master is to assign the ship an anchoring billet and acquaint the captain with the harbor police regulations.

Should a foreign warship or vessel, as an exception, cross the fortress boundaries from seaward at nighttime the welcoming officer is only to be sent the following day. In such a case the ship may anchor at pleasure, or, if it has taken a pilot, according to his direction; but it is bound to shift billet as soon as it may be requested to do so by the station commander in chief or the commandant, etc.

For passage from a German harbor into inland waters foreign warships require special permission, which, if the harbor is fortified, is to be requested from the commandant, etc., of the fortress; in unfortified harbors, from the general commanding concerned direct; for passage through the Eider Canal, from the commander in chief, Kiel. Pilots for such journeys are only to be sanctioned for such foreign warships after such permission has been given.

A notification only is necessary to the competent authority for giving such authority, in the case of the exemption mentioned in the second paragraph of these instructions.

Gun practice takes place periodically at Ise Fiord, off Tisvilde, on the north coast of Zealand, Kjöge Sönakke, Ore, Saltholm Flat, and Karrebæksminde, in Danish, and at Kiel and Holst Bank, in German waters.

Germany—Lights and signals shown from vessels towing targets, etc.—The undermentioned regulations are in force:

(*a*) *The tug.*—A vessel having targets in tow shall, so far as her size and rig will allow, show the following signals:

By night.—In addition to the lights prescribed by article 3 of the Regulations for Preventing Collisions at Sea, three lights in a vertical line, one over the other, visible all around the horizon, the two upper to be red and the lowest white. Should a vessel, in spite of this signal, approach the towing train in a dangerous manner, a blue light will be shown from the tug.

By day.—Two black cones, vertical, points downward.

The above signals indicate that the vessel showing them is towing one or several targets, which may be as much as 1 mile astern of her. Also that the tug is more or less obstructed in her ability to maneuver.

(*b*) *Targets in tow.*—At night, when gun practice is not being carried out at towed targets, and circumstances will permit of it, a white light, visible all around the horizon, will be shown from the end of the last target.

If gun practice is taking place, or is about to take place, this light will not, as a rule, be displayed.

The exhibition of a light from the target can not therefore be relied on.

(*c*) *Anchored targets.*—Every target at anchor will exhibit a white light, visible all around the horizon.

NOTE.—When approaching a vessel which is firing, special caution is required. By night, the direction of the rays of the searchlight indicates to some extent the direction of the fire and the position of the target.

Torpedo practice—Submarine mines.—Torpedo practice and submarine mining are also periodically carried out to the northward of Saltholm and in Kiel Fiord.

The details concerning these exercises will be found in the descriptions of the various places where they occur.

German customs regulation.—Every vessel passing the declaration post of the port to which she is bound must, without being requested, keep as near these as possible or tie up.

For the further voyage, at the discretion of the declaration post, an official escort may be provided or the holds locked up.

Submarine vessels.—When Danish and German submarine vessels are exercising submerged, the vessel escorting them will display two red flags, vertically, and at least 3 feet apart, and all passing vessels should keep a special lookout for any submarines emerging while maintaining, or altering, their own course, as required for navigation.

On observing a submarine coming to the surface it should be remembered that such vessel may not possess manœuvering capacity or be able to make the prescribed signal for alteration of course, and under such circumstances passing vessels should proceed with extra care in order to avoid danger of collision.

When meeting submarine vessels navigating on the surface the usual rule of the road should be observed.

Danish submarine vessels may be met with in the Sound between Saltholm and Hven.

Time signals.—Time signals for correcting chronometers are made at Göteborg and Malmö, in Sweden; at Copenhagen and

Helsingör, in Denmark; and at Kiel, in Germany. At the Swedish and Danish ports the time indicated is 1h. 0m. 0s. p. m., mid-European standard time, which is the equivalent of Greenwich mean noon. At Kiel the time signal is made twice, viz, at noon and at 1 p. m., mid-European standard time; that is, at 23h. 0m. 0s., and noon of Greenwich mean time.

At the telegraph offices of several places mentioned below the signal is also given for 1h. 0m. 0s. mid-European standard time, or Greenwich mean noon, by an audible stroke on the telegraph apparatus, of which a warning note is sounded some minutes previously. For the purpose of comparing their chronometers with the time thus telegraphically indicated, captains are daily allowed access to the telegraph offices of the above-mentioned towns at or about 1h. 0m. 0s. p. m.; Aalborg, Aarhus, Fredericia, Frederikshavn, Helsingör, Horsens, Kallundborg, Kolding, Korsör, Nyborg, Nykjöbing (Falster), Odense, Randers, Rudkjöbing, Svendborg, and Vejle.

Naval establishments.—There are naval dockyards at Copenhagen and at Kiel.

Docks.—There are docks at the following places:

Sweden.—Göteborg, Helsingborg, Limhamn, Malmö.

Denmark.—Frederikshavn, Copenhagen, Hensingbörg, Svendborg.

Germany.—Flensburg, Kiel, Lübeck, and Rostock.

Patent slips will be found at:

Sweden.—Göteborg, Malmö.

Denmark.—Aalborg, Aarhus, Copenhagen, Helsingör, Kolding, Marstal, Nyborg, Vejle.

Germany.—Rostock.

The dimensions and all particulars concerning the docks and patent slips will be found under the description, the places where they are located.

Coal.—Coal in quantities exceeding 500 tons is kept in stock at the following places mentioned in this book:

Sweden.—Göteborg, Halmstad, Helsingborg, Landskrona, and Malmö.

Denmark.—Aalborg, Aarhus, Æroskjöbing, Anholt Havn, Assens, Bagenkop, Ballen, Bandholm, Copenhagen, Fredericia, Fredericks-havn, Grenaa, Guldborg, Helsingör, Holbæk, Kallundborg, Knebel, Karrebæksminde, Kjertminde, Kolding, Korsör, Middelfart, Nyborg, Randers, Roskilde, Saxkjöping, Söby, Skjelskör, Stege, and Svendborg.

Germany.—Apenrade, Flensburg, Kiel, Lübeck, Neustadt, Rostock, Warnemünde, and Wismar.

A small quantity of coal might be obtained at Marstrand, and on the Swedish and Danish coasts there are several small places where coal is obtainable.

Routes to the Baltic.—There are four routes to the Baltic from the North Sea:

1. By the Kaiser Wilhelm Canal.
2. By the Kattegat and through the Sound.
3. By the Kattegat and through the Great Belt.
4. By the Kattegat and through the Little Belt.

The route by the Kaiser Wilhelm Canal will be found described in the North Sea Pilot, (Eastern Shores) and Chapter X of this book.

The Sound, which is the shortest route to eastern ports, has only a depth of about 23½ feet, and is thus only suited for vessels of moderate draft.

Except to ports in the Little Belt or in Kiel Bay, the Little Belt is the longest route for vessels bound further eastward, but has a depth of 6 fathoms through its entire length, and it is frequently used by the German fleet. The Great Belt is the safest channel for deep-draft vessels and fleets.

Directions.—The entrance to the Kattegat presents no difficulty in clear weather or by night, if the lights can be seen, but if they should be obscured by hazy weather, as is frequently the case, the lead is the only guide when rounding the Skaw, and by keeping in more than 40 fathoms a vessel will pass nearly 2 miles northward of it and the lightvessel.

Steering east by north or east by south and sounding frequently, a run of about 18 miles should bring the vessel to Rännan Deep, but it must be remembered that the current may be setting strongly in the same direction, and that Rännan Deep is barely 2 miles in width at the part where it should be crossed, so that only close and careful sounding will be likely to pick it up. This accomplished, however, it becomes, from the increased depth, from probably under 30 fathoms to over 50 fathoms, a valuable guide to the position.

The direction of Rännan Deep being parallel to the coast, passing outside the skärgård at distances of from 2 to 3 miles from Paternosters Skären, Vinga, and Tistlarne, where it ends, a vessel may steer southward, guided by its limits.

A sailing vessel, with a northeast wind, probably accompanied by snow or sleet, might keep along the western limit of Rännan Deep before steering from Vinga toward the eastern banks of Læsö, but with a westerly wind it may be preferable to work up to Aalborg Bay, where convenient anchorage would be obtained if required.

As already mentioned, the Kattegat has two channels, East and West Channels, passing east and west of the islands occupying the central part, and although both are suitable for deep-draft vessels,

the western channel is not recommended for a greater draft than 26 feet, owing to the number of comparatively shallow banks to the southward of Læsö, and on account of its greater depth and width the eastern channel is that generally used.

The prevailing winds in the Kattegat, being from southwest and west, generally drawing more northerly in the northern part, between the Skaw and Læsö, and more southerly in the southern part, between the Kullen and Hesselö, navigation is rendered difficult for sailing vessels proceeding in either direction.

For the above reason, should the barometer indicate bad weather, it would be prudent for a sailing vessel, in one of the anchorages in the Sound, and with a southwesterly wind, not to leave for the northward, as the probability would be that the wind would veer to westnorthwest, and perhaps blow a gale, making the Swedish coast a leeshore. Also a vessel entering the Kattegat under similar circumstances would not keep away for Læsö Trindel lightvessel, as the wind might back to the southward and make it difficult to fetch the Sound.

The currents require careful consideration when navigating the Kattegat, more especially in the neighborhood of the Paternosters skären and Morups Tånge, where they set on to the coast; but a still greater source of danger would appear to be the uncertain, anomalous, and frequent set of the current directly against the wind, which has been clearly proved by numerous observations.

As directions for the Sound and Belts will be given in the descriptions of those channels, it is only necessary here to give those for the approach to them from the Skaw.

If intending to proceed to the entrance of the Sound by passing westward of Fladen, from about 1 mile eastward of the Skaw lightvessel, steer 136° for a distance of 26½ miles to pass 1½ miles eastward of Læsö Trindel lightvessel, and when abreast it alter course to 155° for 45 miles, which should lead about the same distance eastward of Anholt Knob lightvessel.

From this position a 149° course, or more to the eastward, should be steered for 25 miles, or until Hallands Väderö Lighthouse bears 80°, distant about 7 miles, passing eastward of Great Middle Ground, when a 170°-course will lead to about 2 miles westward of the Kullen, and to the entrance of the Sound.

If intending to pass through the Great Belt, from the position eastward of Anholt Knob lightvessel, steer 226° for a distance of about 35 miles, or until Fornæs Lighthouse bears 316°, distant about 8 miles, the vessel having passed nearly midway between it and Briseis Flat, then alter course to 187° for about 24 miles, or until Sejrö Lighthouse bears about 114°, distant 3 miles, when follow the directions for the Great Belt.

Track for deep-draft vessels.—The track recommended to be followed by deep-draft vessels is shown on H. O. Chart No. 4852 by a pecked line. From about 1 mile northeast of the Skaw lightvessel the course is 132° for 46 miles, passing about 4½ miles northeastward of Læsö Trindel lightvessel, to about 2 miles southwestward of Nidingen, with the lighthouses or lights in line.

From this the course is 160° for 25 miles, when Morups Tånge lighthouse should bear 82°, distant 7½ miles, and the course be altered to 166°, for 32½ miles, or until the Kullen Lighthouse bears 157°, 5 miles, when alter to 228° for 22½ miles, or until Hesselö Lighthouse bears 269°, 5½ miles.

From this position a 308°-course for 22 miles leads to Schultz's lightvessel, bearing 5°, distant 1½ miles, and the directions for a vessel of deep draft given in Chapter VII, should be followed.

From the same position, the track to the northward, marked by a pecked line H. O. Chart 4852, is a 37° course for 44 miles, or until Anholt Knob lightvessel bears 315°, distant 4½ miles, when a 26° course for 13 miles should lead to the position before given, with Morups Tånge Lighthouse bearing 82°, 7½ miles.

CHAPTER II.

THE KATTEGAT—COAST OF SWEDEN FROM MARSTRAND FIORD TO THE KULLEN.

The Kattegat is bounded on the northern side by an imaginary line drawn from the Skaw to the entrance of Marstrand Fiord (the principal channel leading to Uddevalla) excluding the Paternosters, and on its eastern side by the Swedish coast; southward as far as the Kullen, a rocky promontory forming the south point of Skelder Bugt. An imaginary line joining the Kullen and Gilbjerg Hoved, the north coast of Sjælland Island, forms its southern boundary, the western boundary being a line joining Revsnæs, the west point of Sjælland Island, to Fornæs.

The Kattegat has two distinct passages on the east and west sides of the islands that occupy the central part, but Læsö Rende on the western side has a number of patches with 4 fathoms and less water over them stretching across its southern approach, and is principally used by vessels proceeding through the Belts or to Jutland ports.

The coast of Sweden from Marstrand, southward to Kullen, with its skärgård extending as far south as Varberg, will be first described.

Aspect.—Between Marstrand Fiord and Måseskär (an islet about 14 miles northward) there are no striking natural landmarks, with the exception of the large island of Orust, the western face of which forms the coast line. It is higher and darker than the rest of the coast, and has three or four tolerably prominent peaks visible in clear weather from a distance of about 30 miles.

The principal peaks on Orust are Orust Vedde, Orust Sadel, and Stora Glippan. Of these Orust Vedde is the highest, and Orust Sadel is considered the best landmark, though it may be difficult for a stranger to recognize it. It consists of three round rocky summits, forming two hollows or saddles.

Stora Glippan is a small hill with a steep face to the south, and is about the same distance northward of Vedde as Orust Sadel is southward. These marks are most conspicuous from abreast of the entrance to Käringö Fiord. Herö is a tilerably high precipitous island about halfway between Käringö and Marstrand Fiords.

Stigberget and Tranerös are two hills on the northwestern part of Tjörn, which island forms the northwestern side of Marstrand Fiord. Stigberget has sloping sides, while Tranerös, immediately southward

of Stigberget, is steeper. Tjörns Hafvud, the southern point of Tjörn, appears, when first seen from the westward, as if it were detached. Veteberget, the highest land on the southern part of Tjörn, has a long slope to the south.

Klädesholm Church, on the islet of that name off the southwestern side of Tjörn, is white, and is tolerably conspicuous from the west or northwest. The tower of Marstrand Fortress, which may be seen in clear weather from a distance of 20 to 25 miles, when first appearing above the horizon resembles a sail.

Approach to Klädesholm and Marstrand Fiord—Paternoster Skären, forming the northwest side of the entrance to Marstrand Fiord, are a number of low, barren islets and rocks extending about 4½ miles in a southwesterly direction from Klädesholm; their position is indicated by the lighthouse on Hamnskär; otherwise they are not easily distinguished beyond a distance of from 2 to 3 miles, and are best seen from the northwest. The northwestern and western sides have no dangers extending beyond a distance of ½ mile off.

Light.—On Hamnskär, the southern islet of the Paternoster Skären, from a red iron tower 105 feet in height, a revolving white light is exhibited, at an elevation of 117 feet above high water, and is visible 17 miles.

Fog signal.—See Light List.

Channels.—There are several passages through Paternoster Skären, but none should be attempted without local knowledge. Of these the passage westward of Vanholmar is the best (Scandinavia Pilot, Vol. I), and others are eastward and westward of Stora Pottan and between Hamnskär and Rön.

Beacon.—A stone beacon, in the form of a truncated cone, and painted in diagonal stripes, marks the western end of Vanholmar.

Perch.—A rock awash about 400 yards southward of the beacon is marked on its north side by a perch, painted black.

Dangers.—The following dangers lie in the fairway at the entrance between Paternoster Skären and North and South Kråkan.

Storebädan, two patches with depths of 3¾ and 4¾ fathoms, situated about 1½ miles southwestward of Paternoster Lighthouse.

Hatteberget, with 4½ fathoms water over it, nearly 2 miles south-southwest of the same lighthouse; a 7-fathoms patch lies nearly a quarter of a mile southeastward of Hatteberget.

Kråkebåden, with 1½ fathoms water over it, about 1,600 yards westward of North Kråkan.

Buoy.—A red-spar buoy, surmounted by a down-turned broom over a ball, is moored on the northwest side of Kråkebåden.

Southeast side.—On the southeast side of the entrance to Marstrand Fiord are several islands, separated by narrow channels. Of these islands Busholm, Ramholm, Erholm, Marstrand, and Koön

are the outermost; nearly 1 miles westward of the two first-named islands are North and South Krakan, two rocks which form the outer visible dangers on that side.

Lights.—Two unwatched lights are exhibited between July 6 and June 6 from Ramholm: The northern, occulting with white, red, and green sectors, at an elevation of 40 feet above high water, from a concrete and iron tower 40 feet high; the white light is visible 6 miles, the red light 4 miles, and the green light 3 miles in clear weather. For sectors, see Light List.

The southern light 131° distant 139 yards from the northern light, is flashing white, and shown at an elevation of 17 feet above high water, from a lantern on the gable of a white house, 11 feet in height; it is visible 3 miles.

Entrance—Depths.—The entrance to Marstrand Fiord, which is common to Klädesholm and Marstrand, is 2½ miles in width between Hamnskär Island and North Kråkan, and has depths of from 14 to 30 fathoms; there are depths of 6½ fathoms in the approach to Klädesholm to the northward, and the same depth in the southern channel to Marstrand, while the northern channel to that place may be used by vessels drawing 20 feet at low water.

Marstrand Fiord leads to Hake Fiord, which stretches to the northeastward, and to Elgö Fiord, which has an easterly direction; the channel to Uddevalla branches off it, that town being distant 34 miles from Marstrand.

Stora Dyrö, about ¾ mile in length and ½ mile in width, is situated on the northern side of the entrance to Elgö Fiord and about 2¼ miles northeastward of Marstrand.

Light.—On the southwest side of Stora Dyrö a cylindrical iron tower painted white, exhibits, at an elevation of 42 feet above high water, an unwatched occulting light with white and red sectors; the white light is visible 7 and the red 5 miles. For sectors, see Light List and Charts.

There are also lights on Elgö for the convenience of vessels proceeding up Marstrand Fiord to Uddevalla. (See Scandinavia Pilot, Vol. I.)

Pilots can be obtained at Mollösund, Kyrkesund, Marstand Town, and Hattan.

Rocket apparatus.—A rocket apparatus is stationed on Gronskären, 7¼ miles northward of Hamnskär Lighthouse.

(For a detailed description of the coast northward of Kladesholm, see Scandinavia Pilot, Vol. I.)

Klädesholm Harbor, between the islands off the southwestern side of Tjörn on the east side of Klädesholm and Koholm on the west, is an excellent place of refuge, particularly for vessels meeting a westerly gale off the Skaw, or southerly gale in the Kattegat.

On some of the islands there are rings for mooring or warping which are very useful when getting under way. The harbor may be entered from the northward between the Paternoster Skären or from the southward by Marstrand Fiord.

Blåkullen, a high rounded hill on Brattö, about 5½ miles eastward of Marstrand, is a good mark for Marstrand Fiord.

Gråen, a small island about 400 yards in extent, is situated in the southern approach to Klädesholm, about ½ mile southward of that island.

Light.—On the south side of Gråen is a white house 11 feet in height, and from a lantern at its corner is exhibited, at a height of 68 feet above high water, an unwatched red and white occulting light, the red flashes over Våggen and Truskären and white flashes in the channel from Marstrand Fiord and over the anchorage; the light is exhibited from July 6 to June 6, and the white flashes are visible 6 miles and the red flashes 4 miles. (For sectors, see Light List.)

Shoal.—A shoal with a depth of 2¼ fathoms over it lies 200 yards eastward of Gråen.

Storm signals are shown at Klädesholm.

Communication.—There is a telephone station at Klädesholm.

Directions.—The entrance to Marstrand Fiord is divided into three channels by Storebådan, Hätteberget, and Kråkebåden.

The leading mark for entering Marstrand Fiord, between Paternosters Skären and Storebådan, is Blåkullen, in line with the north point of Koön, on which there is a white beacon, bearing 77°, and that for entering between Storebådan and Hätteberget, Blåkullen kept open north of Marstrand Tower three times the breadth of the whole of the fortress, bearing 71°.

Entering farther south, between Hätteberget and Kråkebåden, Blåkullen should be kept open south of Marstrand Tower, one breadth of the whole fortress, bearing 67°.

Anchorages.—The following anchorages are on the northern side of Marstrand Fiord:

Buskären.—In case of necessity a vessel might anchor between Buskären and Skärileja in depths of from 16 to 17 fathoms, over soft clay.

Gråen Road, northeastward of Gråen, has anchorage in from 14 to 16 fathoms water, over clay, and is an easier position for a sailing vessel to proceed to sea with easterly or southerly winds than from Klädesholm Harbor, but a heavy swell rolls in with southwesterly winds.

The anchorage at Klädesholm is in depths of from 9 to 10 fathoms, over clay.

A vessel may also anchor in from 17 to 19 fathoms water, over clay, in any part of the fiord excepting between Marstrand Island and Paternoster Skären, where, on a long bar named Hæklan, there are depths of from 14 to 15 fathoms, with foul ground.

Directions.—Having entered by either of the channels above mentioned, a vessel may steer for Klädesholm Church when it is open eastward of Skärileja Rock, bearing 17°, and proceed westward of Väggen and close eastward of Gråen, avoiding the 2¼-fathom shoal, and steer about north-northeast for the anchorage.

A sailing vessel, with a southerly wind, and unable to fetch into Marstrand Fiord, may bear up and run into Klädesholm, which is a good harbor of refuge, as before stated.

Klädesholm Harbor may be approached also by an 11-foot channel dredged between the Islands Tjörn and Kalfven.

By night the sector of white light from Stora Dyrö shows over Storebådan and Hätteberget, and keeping near its northern limit, bearing about 64° and southward of the red sector covering Paternoster Skären, leads between those rocks and Storebådan, while the white light bearing 55° leads between Storebådan and Hätteberget.

Keeping near the western limit of the white sector from Gråen Light, bearing 14°, leads between Skärileja and Truskären and up to Gråen.

(For a description of Uddevalla and its approaches, see Scandinavia Pilot, Vol. I.)

Marstrand Hamn, although small, is an excellent harbor, affording good shelter, especially to vessels moored alongside the quay, of which there is about 1,850 feet, but the greatest depth alongside is 6½ feet. It is accessible in all but the severest winters; the southern part of the harbor is somewhat exposed to the swell, but a vessel with good anchors and cables can without difficulty ride out a westerly gale.

Light.—On the western point of Koön Island, a flashing light, with white, red, and green sectors, is exhibited, at an elevation of 23 feet above high water, from a lantern placed at the height of 28 feet on the gable of a dwelling painted red; the white light is visible 10 miles, the red light 6 miles, and the green light 5 miles. (For sectors see Light List.)

Storm signals are shown from a mast at Marstrand Hamn. See Chapter I.

Entrances—Depths.—Marstrand has three entrances—one northward of Marstrand Island, available to vessels drawing 19 feet water; one southward of the island, leading between Tollskären and Erholm, with water sufficient for the deepest-draft ships; and a passage marked by beacons and buoys from the southeast by Albrektsunds Canal, with a depth of 8 feet at low-water spring tides. There

is also an approach called Draget between Erholm and Klöfverö, which should not be used without a pilot. The depths in the harbor are from 4¾ to 6½ fathoms, over clay.

Dangers.—In the southern entrance to Marstrand a rock, with 2½ fathoms water over it, is situated about 100 yards off the northeast point of Erholm.

A rock lies about 140 yards northeastward of the southeast point of Marstrand Island.

A rock awash lies on the eastern side of the harbor.

Perches.—A perch, with upturned broom, marks the west side of the shoal in the eastern part of the harbor.

A perch marks the eastern side of the rock off the southeast side of Marstrand Island.

A perch with upturned broom marks the edge of the shoal water on the eastern side of the northern entrance.

Anchorage.—The anchorage, in depths of from 6 to 7 fathoms over clay, is about 400 yards eastward of the southeast extreme of Marstrand Island.

Directions.—Having entered the fiord by one of the three channels already described, if intending to use the southern entrance to Marstrand Hamn Pass between Tollskären and Erholm, giving the northeast point of the latter a berth of 200 yards to avoid a rock with 2½ fathoms water over it. Pass in mid-channel southward of Marstrand, and anchor between the north point of Klöfverö and the water mill on Bakarholm, taking care to avoid the rock off the southeast point of Marstrand Island.

Town.—Marstrand, a small town situated on the east side of Marstrand Island, had a population of 1,530 in 1908, but it is visited by about 3,000 persons during the bathing season; it is commanded by the disused fortress of Karlstën. The Church of St. Mary, which is handsome, was built in the fifteenth century, and Marstrand is a favorite summer resort of the King of Sweden.

Communication.—Marstrand has a service of steamers to Göteborg, Uddevalla, and Christiania, calling at intermediate ports; those to Göteborg run daily. There are post, telegraph, and telephone offices, but the nearest railway station is at Skarby, distant 13½ miles.

Coal and supplies.—About 150 tons of coal are kept in stock; fresh provisions can be procured in small quantities, and excellent water from Koon.

Inside passages.—The coast southward of Marstrand Fiord, as far as Nidingen, is fronted by innumerable islands, rocks, and shoals, and eastward of, and sheltered by them, are several channels to Göteborg; from Marstrand Fiord they are entered through Sille Sound, southward of Klöfverö.

Most of these channels, although narrow in places, may be used by large vessels; but being also intricate, with irregular currents, local knowledge is necessary; as a rule they are well lighted, and most of the shoals in the most dangerous positions are marked by buoys or beacons.

Sälö Fiord is situated 3 miles southward of Klöfverö, and about 1 mile northward of Rörö, and between these two islands are islets, rocks, and dangers, too numerous for description; Dörieskär, the outermost rocks above water, lie about midway between, and rather over a mile westward of a line joining the two islands.

Yttre and Inre Lekskär are two islets or rocks situated on the northern side of Sälö Fiord and between 1 and 1¼ miles southward of Klöfverö.

Light.—On the Inre Lekskär a cylindrical white iron house, 11 feet in height, exhibits, at an elevation of 24 feet above the level of the sea, an unwatched group flashing light with white and red sectors; the white light is visible 6 miles, and the red light 3 miles, in clear weather. (For sectors, see Light List and Chart.)

Beacon.—On Inre Lekskär is a beacon checkered red and white and 42 feet high.

Sälö, an islet about ¼ mile in length in a north and south direction, and 300 yards in width, lies 1½ miles north-northeast of Rörö.

Light.—On the west side of Sälö, from a lantern 11 feet in height from an octagonal iron hut, painted white, a group flashing unwatched light, with white, red, and green sectors, is exhibited, at an elevation of 47 feet above sea level; the white light is visible from the southward 10 miles, and from the northward 6 miles, the red 4 miles, and the green 3 miles. (For sectors, see Light List and Chart.)

The above lights are for use in the inner navigation of the fiord.

Entrance—Depths.—Sälö Fiord may be entered either northward or southward of Dörieskär, but the safest channel is that nearly a mile northward of Rörö, between Bredabåden and Störa Hallorskären on the north, and Räfven, Fårnytta, and Kullen on the south side; the least depth in mid-channel is 6½ fathoms, but a shoal, with 3¼ fathoms water over it, lies about 400 yards northward of Kullen.

Dangers.—On the north side of the channel Bredabåden and Svenebådar, each with a depth of 2 fathoms, lie 1.4 miles and 1,600 yards, respectively, west-northwest of Störa Hallorskären, and about 300 yards southeastward of the latter is Torkselb, on which the depth is 1¼ fathoms.

On the southern side a shoal with a depth of 1 fathom lies 400 yards north-northeast, and Svaneflu, awash, ½ mile eastward of Räven.

Anchorage.—The anchorage, in from 6 to 9 fathoms water over clay bottom, is from 400 to 600 yards eastward of the northeast point of Rörö. There is also an anchorage for small vessels of not more than 13 feet draft between the shoals southward of Rörö, approached by narrow and intricate channels from seaward, both eastward and westward, and only practicable for those having local knowledge.

Directions.—Räfven, on the northern side of which there is a large and conspicuous rock, is a good mark for entering, and passing 600 yards northward of it a 94° course leads about the same distance northward of Kullen, avoiding the 3¼-fathom patch; after having passed which, keep the same distance east of it and Rön, and steer for the anchorage.

Stora and Lilla Pölsan are two high, dark, and rather conspicuous rocks; Stora Pölsan, the outer, lies distant 2.7 miles west-southwest of the north point of Rörö, with some dangers between; Stora Pölsan is fairly steep-to on its western side.

Kallo Fiord.—Hyppeln is situated about ¼ mile southward of Rörö, separated from it by a channel full of rocks and shoals, and nearly 1 mile eastward of Hyppeln is Källö Fiord, a spacious and good anchorage, but owing to the dangers in the approach not being buoyed, it would be advisable to take a pilot.

The outer islands on the southeast side of the entrance to Källö Fiord are Lindholm and Burö, and on the west point of the latter is a whitewashed patch used by the pilots as a mark.

Stora Oset, about 200 yards in extent, lies about ½ mile southward of Hyppeln.

Lights.—On the eastern end of Stora Oset a group-flashing unwatched light, with white, red, and green sectors, is exhibited, at an elevation of 41 feet above high water, from a lantern on the gable of a house, 8 feet in height; the white light should be visible 11 miles, the red 8 miles, and the green 6 miles, in clear weather. The light is shown from 6th July to 6th June.

Two unwatched leading lights, 715 yards apart and in line bearing 161°, are exhibited from lanterns 11 feet in height, on the corners of white houses, situated on the west coast of Björkö Island, which forms the southeast side of Källö Fiord.

The north light, occulting white, is exhibited at an elevation of 26 feet above sea level; visible 6 miles.

The south light, flashing, white, is shown at an elevation of 105 feet above sea level, and is visible 10 miles.

Torrboskär, situated 1¼ miles southwest of Hyppeln, is 2 feet above water, of a reddish color, and has sunken rocks lying from 400 to 800 yards from it, except on its southern side. It lies off and immediately southward of the entrance to Källö Fiord.

The outer danger off the northwest side of Torrboskär is a shoal with 1 fathom water over it, at a distance of ¼ mile.

A shoal, about 600 yards in extent, with a least depth of 2¼ fathoms, lies about 700 yards off its western side.

Beacon.—The beacon on Torrboskär, 42 feet in height, consists of a mast with supports painted red, on which is formed with white boards a triangular shape, surmounted by two black arms, which point in opposite directions; it may be seen from a distance of 6 or 8 miles in clear weather.

Entrance—Depths.—The northern entrance, between Grytan Rocks, which are ⅓ mile southward of Hyppeln, and Stora Oset, is about 350 yards in width, with a depth of 10 fathoms; the southern entrance, between Stora Oset and Lindholm, is about 800 yards in width, and has a similar depth.

Anchorage may be obtained in Källö Fiord in depths of from 5½ to 7 fathoms, over clay, the best position being about 700 yards northward of Källö, in a depth of 6½ fathoms.

Beacon.—On the northern side of Källö Fiord and about ¼ mile eastward of Rörö is Magholm, on the north point of which is a black and white stone beacon.

Directions.—Entering by the northern and better entrance of the two, when about 2 miles off, bring Rös, a cairn on the summit of Stufö, in line with Stora Oset Lighthouse, bearing 104°, which leads up to the latter islet, until a house of Knippla, the southern part of Källö, is seen midway between Grytan and Stora Oset, and about in line with a pointed hill on Björkö, 91°, when alter course for it to pass in mid-channel.

Pass northward of Lilla Oset, and when the north point of Källö bears 38° steer for it between Svarlskär and a 1¾-fathom patch westward of it, and then northward for the anchorage.

If entering from the southward, the eastern slope of a hill on Kalfven, an islet southward of Hyppeln, in line with Torrborskär Beacon, bearing 46°, leads up to the latter islet, which should be passed at a distance of 400 yards on its eastern side, and a 52° course then steered to pass between Stora and Lilla Oset, afterwards following the directions above.

When entering southward of Torrboskär the latter and Stora Oset should not be approached on their southeastern sides nearer than 400 yards.

A vessel may also pass southeastward through a narrow deep channel between Knippla and Stufö to the anchorage in Kalf Sund.

From the anchorage in Källö Fiord, vessels may also proceed to sea eastward of Rammen, and through Svanen Pass; or southward through the inside channel, and to sea southward of Buskär and Vinga.

By night approach in the white sector of Stora Oset Light, bearing 103°. The leading lights on Björkö in line, bearing 162°, leads from Källö Fiord to Sälö Fiord, between Rammen and Mågholm.

Islands—Anchorages.—Between Lindholm and the entrance to Vinga Sund are two comparatively large islands, forming the outer or western side of the inner channels; Ockerö, the northern, is about 1⅝ miles in length in a north and south direction, and 1 mile wide, and Hönö, the southern, 2½ miles in length in a northwest and opposite direction, with a greatest width of 1½ miles.

Öckerö Sund.—Vessels may, with the assistance of a pilot, enter either northward or southward of Lindholm, through a narrow and intricate channel leading through Öckerö Sund on the northern side of Öckerö, where the depths are from 4 to 6 fathoms, and whence they may proceed southward, through Stora Kalf Sund and the inside channels.

Lindholm Anchorage, on the eastern side of Lindholm, affords anchorage in a depth of 7 fathoms, but the space is contracted, and a heavy swell comes in with winds from seaward.

Bollskären, two groups of rocks, surrounded by shoal water, are the next outer danger southward of Torrboskär, and lie about ⅜ mile northwestward of the northwest end of Hönö.

Hönö Nödhamn, between the northwest end of Hönö and Öckeröhufvud, has depths of from 3¼ to 6 fathoms, over clay; it may be entered north or south of Bollskären, but a heavy sea sets in with northwest winds. There are rings for mooring.

Hönöhufvud is an islet about a cable in extent, situated 2 cables southward of the west point of Hönö. Hönöbäde, some small rocks, lie about 4 cables southwest of Hönöhufvud.

Lights.—From a white building on Hönöhufvud a group occulting light, showing white, red, and green sectors, is exhibited, at an elevation of 63 feet above the level of the sea; in clear weather the white light should be visible from a distance of 7 miles, the red light from 4 miles, and the green light from 3 miles, but it is a fishing light, and unwatched.

Stora Kalfsund.—Vessels may anchor anywhere in the inside channel, in various depths of water, southward of Rörö, but one of the best anchorages is in Stora Kalfsund, between Öckerö on the western side and the southern part of Björkö and Kalfö on the east. Stufö and Hällsö, two islands apparently joined to one another, form the northern side of Stora Kalfsund.

Kalfo, about ⅜ mile in length in a north and south direction, and 600 yards in width, lies off the southwest end of Björkö, separated from it by Lilla Kalfsund, which is very narrow.

Lights.—A flashing white light is exhibited at an elevation of 56 feet above the sea level, from a lantern 11 feet high, on a white house, situated on the southeast side of Stufö; it is visible 10 miles.

On the eastern side of Hällsö an occulting white light is exhibited, at an elevation of 23 feet above the sea level, from a white octagonal lantern on concrete base, 13 feet in height. It is visible 12 miles.

These lights in line, bearing 331°, lead through Lilla Kalfsund.

Beacon.—A pyramidal beacon, 49 feet in height and painted red, stands on the center of Kalfö, at an elevation of 151 feet above sea level, and is surmounted by a small Maltese cross; it should be visible from distances of from 14 to 16 miles, and serves as a mark in the inner channels northward of Vinga.

Entrances.—Stora Kalfsund may be entered from the northward on either side of Stora Orset, thence southward of Knippla, and between Stufö and Hällsö, on the west, and Björkö, on the east. The least depth in this channel is about 5½ fathoms.

From the southward small vessels enter southward of Hönö, or it may be entered through Vinga Sund and Dana Fiord.

Buoys.—Rossbådan and Köpenhamnsbo, two shoals, southward of Grötö, are marked on their western sides by red spar buoys; the first having an upturned broom, and the second two down-turned brooms as top marks.

Anchorage may be obtained in Stora Kalfsund in depths of from 10 to 11 fathoms, midway between the east point of Öckerö and Kalfö, or southward of Ledskär in 4¼ fahtoms, the bottom being clay.

Pilots.—A pilot can only be obtained by telegraphing to Göteborg.

Directions.—Vessels entering from the southward should pass westward of Rossbådan and Köpenhamnsbo, as several shoals exist between these and Gröttö.

Communication.—There are telephone offices at Stora Kalfsund and Öckerö.

Varholm Sund, eastward of Stora Varholm, is also an excellent harbor for vessels passing through the inside channels and has depths of from 5 to 7 fathoms; it may be entered either from the northward or from the southward.

Lights—Stora Varholm.—On the western point of Stora Varholm a lighthouse, 11 feet in height, exhibits at an elevation of 49 feet above sea level, an unwatched group occulting light, with white, red, and green sectors; in clear weather the white light should be visible from a distance of 6 miles, the red light from 4 miles, and the green light from 3 miles.

Lilla Varholm.—Two leading lights bearing 314° and 134° from each other, and 143 yards apart, are shown from lanterns at the corners of white houses, situated on Lilla Varholm; the front light is

occulting white and the rear flashing white. These lights are visible 11 miles.

Rödskärbräte, a shoal with 1½ fathoms water over, lies ⅔ mile southward of Stora Varholm in the approach to Varholm Sund.

Buoy.—The eastern side of Rödskärbräte is marked by a black spar buoy surmounted by a ball.

Depth.—There is a least depth of 22 feet in Varholm Sund and the channel between Stora and Lilla Varholmen.

Approaches to Göteborg—Vinga Sund.—From the southern side of Hönö a number of islands and rocks extend in a southerly direction for a distance of 3½ miles and occupy a space nearly 3 miles in width; the largest of these are Fötö, Halleskär, Inholmarne, Vinga, and Buskär.

These islands and rocks, which form the western side of Vinga Sund and Dana Fiord, have several passages through them leading to the sund and fiord, but the widest and clearest channel is eastward of and between them and Galtö, Känsö, and Vargö, which are on the eastern side of the entrance to Vinga Sund.

Vinga Sound, between the island above mentioned and Galtö, is a commodious roadstead, useful especially for sailing vessels outward bound, during northwest or west winds, or for those bound to Göteborg, meeting contrary winds in the narrow channels, but a heavy sea sets into it with a gale from southwest.

Buoy.—A red buoy, with ball and upturned broom over it, is moored on the southern side of Ryggen Shoal, situated westward of Inholmarne.

Vinga, the southwesternmost of the islands above mentioned, is about ⅔ mile in length, in an east and west direction, nearly ¼ mile in width, and 67 feet in height. Kolholm, a smaller island, lies close off its southeast side, connected to it by a pontoon bridge, and Vingaungar, a cluster of rocks, is situated about 400 yards off its northwest end.

Light.—A square granite tower, 95 feet in height and painted with a central black band, is situated near the southwest and on the highest part of Vinga and exhibits at an elevation of 151 feet above sea level, a group flashing white light. It should be visible, in clear weather, from a distance of 19 miles.

Fogsignal.—See Light List.

Leading lights.—Near the southeast part of Vinga are two wooden houses, painted white, with a black band, which exhibit leading lights 410 yards apart, and in line bearing 254°.

The lights are fixed red and shown at elevations of 64 and 31 feet above sea level, respectively.

Beacon.—Near the main lighthouse on Vinga is a red pyramidal shaped beacon, 80 feet in height, which is surmounted by a staff and

black ball. The beacon itself should be visible, in clear weather, **from** a distance of 16 miles, but the staff and topmark will not be **distinguished** from a greater distance than 4 miles.

Ice signals are made from a frame, painted white, placed half-**way** up the western side of the beacon, with a disc, painted white, **above** it. (See Chapter I.)

Lightvessel signals.—Westward of the beacon is a signal mast **and** yard, from which signals are made denoting the lightvessels **that** are absent from their stations. (See Chapter I.)

Lloyd's signal station.—Vinga is a Lloyd's signal station and **has** telegraphic communication. Vessels can communicate by the **International** Code, and their messages will be transmitted.

Storm signals are made from Vinga. (See Chapter I.)

Pilots are stationed on Vinga.

Submarine telegraph cable.—A submarine telegraph cable con-**nects** the eastern end of Vinga with Galtöhufvud, the northwest **point** of Galtö.

Buskär, an island about ½ mile in length in an east and west direc-**tion,** and 300 yards in width, situated 1¾ miles eastward of Vinga, **is** the southeasternmost of the group of islands extending southward **of** Hönö; between it and Vinga is Fjärdskären, a small island.

Light.—On the southern side of Buskär a cylindrical tower, 15 **feet** in height, with a dwelling attached, exhibits, at an elevation **of** 72 feet above sea level, a group flashing light, with white, red, **and** green sectors; the lights are visible respectively, 12, 8, and 7 **miles.**

Dangers.—Between Vinga and Buskär the most outlying dangers **are** as follows: Klöfskär, a small group of rocks above water, situ-**ated** about 800 yards southward of Fjärdskären.

Stora Röset, a shoal with a depth of 1½ fathoms over it, lies about **600** yards southward of Vinga, with a shoal of 2¼ fathoms about 350 **yards** southward of it. Junge Jan awash is about ¼ mile west-north-**west** of Klöfskär.

Grytan and Svartskär are rocks above water about midway be-**tween** Klöfskär and Buskär, and about 103° of Svartskär is Svarts-**kärsbo,** with 1½ fathoms water over it; about the same distance 193° **of** Buskär is Bredbåden, with the same depth. Gamla Gumman, **with** 4¼ fathoms water over it, lies about 0.9 mile southward of **Klöfskär,** and Ekskärbåde, with a depth of 3¾ fathoms, is ⅔ **mile** southeastward of the same rocks.

Beacon.—Klöfskär is marked by a stone beacon, 11 feet in height, **and** painted red and white in checks.

Buoy.—Gamla Gumman is another on its southern side by a red **buoy** surmounted by two upturned brooms.

Channels.—There are two principal channels through these islands, leading to Vinga Sund.

Hålskärsleden, the northern of these, is entered between Fjärskären (which lies about 1½ miles southwestward of Hönö, and is not to be mistaken for the small island eastward of Vinga), on the north, and Inholmarne on the south.

Beacons and buoys.—The following dangers in this channel are marked: Skarpenbock, about 300 yards southeatward of Fjärskären, is marked by an iron pole beacon, 40 feet high, with a white band; a white cairn beacon, with a red band, is eastward of it.

Lilla Hålskär, 800 yards eastward of Skarpenbock, is marked by a beacon, 11 feet high, with a black band.

Lilla Vipskär, 1.4 miles eastward of Lilla Hålskär, is marked by a red fixed perch.

A shoal with a depth of 2 fathoms over it, lying in mid-channel between Gallskär and Ekskären, is marked on its north side by a black spar buoy, surmounted by a ball.

On the south side of the channel, Lucebådarne, with 1 fathom water over it, is marked, on its north side, by a black spar buoy, surmounted by two balls.

Bifrostgrund, with a depth of 1¾ fathoms, is marked, on its north side, by a black spar buoy, surmounted by a ball.

Depth.—There is a least depth of about 4¼ fathoms in this channel.

Anchorage may be obtained in the northern part of the channel in depths of from 7 to 8 fathoms, near Hålskär, and eastward of the outer shoals.

Directions.—Pass northward of the shoal ground, with a depth of 1½ fathoms, extending about 300 yards northward of Inholmarne, steering an easterly course in mid-channel, and when southeast of Lilla Hålskär Beacon, steer to pass northward of the shoal in mid-channel and between Lilla Vipskär Beacon and the black buoy marking Bifrostgrund into Vinga Sund. Several shoal spots having been recently found in this channel, it should not be attempted by a stranger, but a pilot should be employed.

A 3-fathom shoal lying about ¼ mile southward of Tannskär, and on this track, must be avoided.

Anchorage—Depths.—The depths in Vinga Sund are from 15 to 16 fathoms, and the holding ground of clay is good. The best anchorage is with Buskär Lighthouse bearing 224° and Böttö Light 86°, unless it should be blowing strongly from the southwest, when it would be advisable to anchor in from 14 to 18 fathoms, ¼ mile nearer Buskär, but not until that lighthouse bears 238°.

The southern channel, on the western side, is entered between Inholmarne and Köttstycket on the north, and Vingaungar, Vinga, and Vitten on the South.

Light.—On the southern rock of Vitten a cylindrical tower, the lower part of gray granite and the upper part iron, painted white, exhibits, at an elevation of 33 feet above sea level, an unwatched flashing and occulting white and red light. The white and red lights are visible 11 and 8 miles, respectively. For sectors see Light List.

Beacons and buoys.—The following dangers in this channel are marked as follows: On the north side, Limbåden, which breaks, is marked by a fixed red perch placed west-southwest of a patch, with a depth of 1½ fathoms.

Buskärs båden, with less than 1 fathom water over it, on its south side, by a spar buoy surmounted by a broom.

On the south side, Lejbråten, awash and breaking, by a black fixed perch with two triangular topmarks.

Ekskärsflacket, with 2¾ fathoms water over it, on its northwest side by a spar buoy surmounted by a ball.

Depth.—The least depth in this channel is about 8 fathoms.

Directions.—Enter the channel with Stora Rös on Styrsö in line with Vitten Lighthouse, bearing 107°, and when about 100 yards from Vitten steer 73°, with the two leading lighthouses on the east end of Vinga in line, bearing 254°, as a stern mark, passing between Ekskärsflacket and Limbåden, and southward to Buskärsbåden into Vinga Sund.

It would not be advisable for a stranger to attempt either of the two preceding channels without a pilot, and in the latter channel patches of from 3 to 3¾ fathoms lie very close to the track.

Main channel.—The main or principal channel into Vinga Sund is between Buskär on the west, and the dangers which lie off Styrsö, Vargö, Känsö, and Galtö on the east side. The dangers southwest of Buskär and on the western side of this entrance have been already described.

Light.—On Böttö, a rock about 400 yards westward of Galtö Hufvud, is a red tower 41 feet in height, with a dwelling, which exhibits, at an elevation of 45 feet above sea level, a fixed, flashing, and group flashing white light.

Fog signal.—A fog siren sounds 1 group of 2 blasts every minute. A fog bell sounds 2 strokes every 2 minutes in case siren is damaged.

Landmarks.—Stora Rös on Styrsö is a conspicuous pointed rocky hill, which may be seen from a distance of 12 miles.

Känsö Tower, on the summit of Känsö, is 30 feet high, built of red bricks, with apertures resembling loopholes, and stands on a granite base; it is used as a lookout.

On the summit of Brännö is a white cairn beacon, 13 feet high.

Dangers—East side.—Hästbåden, a rock about 1¼ miles southwestward of Vargö, is the outermost danger on the east side.

Känsö Fjärskär is an islet situated ½ mile westward of **Känsö**, and between it and Hästbåden is Kräkö, an islet or rock; several shoals are situated in this vicinity, as will be seen from the chart, the two outer, between Hästbåden and Kräkö, are Rackorna, awash, and Kråköbåde, with a depth of 3 fathoms over it.

Beacon.—Känsö Fjärskär is marked by a white beacon 11 feet in height, surmounted by a ball.

Fjärskärsbåden, with 1½ fathoms water over it, is about ⅓ mile west-northwest of Känsö Fjärskär.

Between Fjårskärsbåden and Galtö Hufvud are Flata Brunskär and Trinda Brunskär, and about 400 yards north by east of the latter is Kocken, awash.

Between Kochen and Böttö are two shoals, Rosenbåden, the southern, with a depth of 1 fathom, and the northern with 2 fathoms.

Buoys.—Fjärskärsbåden is marked on its north side by a black spar buoy, surmounted by a ball.

Rosenbåden is marked on its north side by a black spar buoy, surmounted by a ball.

Depth.—The general depths in the main entrance to Vinga Sund are from 14 to 18 fathoms, but there are some patches of 4¼, 5½, and 7 fathoms, the positions of which will be seen on the chart.

Directions.—Böttö Lighthouse, by day, or the fixed sector of white light by night, bearing between 22° and 41°, leads through the main entrance, and when Buskär Lighthouse or light bears 283° the course may be altered to north for the anchorage.

The eastern limit of the white fixed sector of light from Stora Varholm, bearing 5°, leads about 400 yards eastward of Buskär, and the western limit of the green fixed sector from the same lighthouse, 351°, leads a similar distance westward of Böttö.

Göteborg approach.—The approach to Göteborg from Vinga Sund, between the islands southward of Hisingen on the north and Galtö, Brännö, and Rifö on the south side, is about 1½ miles wide and has two main channels, the northern being the broader and more direct of the two; the southern, which is narrow, is along the north side of the latter islands.

The channels pass through Hake and Rifö Fiords, and about 1 mile eastward of the latter, where they join, the approach narrows considerably, and farther eastward commences a dredged channel to Göteborg.

Southern channel—South side.—Brännäsbrate is a rock at the extreme of a shoal spit which extends for a distance of about 800 yards in a northwest direction from the north point of Galtö.

Light.—On Brännäsbrate, from a lantern on the corner of a white house, and on iron supports, an unwatched group flashing light with white, red, and green sectors is exhibited at an elevation of 19 feet above sea level; the white is visible 9 miles, the red light 6 miles, and the green light 5 miles.

Rifö.—Kållähufud, the northwest extreme of Rifö, is situated about 1½ miles eastward of Brännäsbrate, and between it and the north point of the same island is a bay about ½ mile in extent.

Carnegieska Factory is situated on the south side of the narrow channel leading to Göteborg and about 3¾ miles 58° of the north point of Rifö.

Leading lights.—At Carnegieska Factory is the western of two pillars, the eastern being situated 79°, distant 1,050 yards, from it, and from the latter a fixed white light is exhibited at an elevation of 189 feet above sea level.

From the western pillar, at an elevation of 118 feet above sea level, an occulting white light is exhibited.

Radio telegraph station.—A telegraph station situated about ⅔ mile southwest of Carnegieska Factory is for public use, the call letters being GSG.

Dangers.—The following dangers on the south side of the channel are marked by buoys:

Kuskärsbåden, with a depth of 5 feet, about 600 yards northward of Kallöhufvud, on its north side, by a blask spar buoy surmounted by a ball.

Svinholmsgrund, with a depth of 1¼ fathoms, and lying ¾ mile 14° of the north point of Rifö, on its north side, by a black spar buoy surmounted by two balls; also on its southwest side by a spar buoy surmounted by a broom.

Hunnelbåden, on which the depth is 1¼ fathoms, lies about 1,200 yards 36° of Svinholmsgrund.

Lightbuoys.—A black and white lightbuoy, exhibiting a flashing white light, is moored about 200 yards northwest of Hunnebåden.

Buoys.—This shoal is also marked on its west side by a black and white spar buoy surmounted by a ball; on its north side by a black perch; on its east side by a red and black buoy; and on its south side by a spar buoy with two upturned brooms.

Lightbuoys, painted black and exhibiting fixed red gas lights, as well as other buoys, mark the south side of the channel eastward of Alfsborg, the northern side being marked by perches.

North side—Vasseskären, on the north side of the entrance to the southern channel, is a cluster of islets and rocks from 1,000 to 1,200 yards in extent.

Gefveskär, also a cluster of rocks, is about 1½ miles eastward of Vesseskären.

Light.—From a lantern on the corner of a red dwelling, 20 feet in height, situated on Gefveskär, an occulting light with white, red, and green sectors is exhibited at an elevation of 21 feet above sea level.

Shoal.—A shoal with 5½ fathoms over it, formed by the remains of a sunken wreck, lies about 250 yards southward of Gefveskär Light.

Knippelholm is situated on the northeast side of Rifö Fiord, 1,200 yards westward of Alfsborg Fort.

Light.—On the southeast part of Knippelholm, from a dwelling painted red, an occulting light with white, red, and green sectors is exhibited at an elevation of 25 feet above sea level; the white light is visible 10 miles, the red 9 miles, and the green 7 miles.

Ryanäs is a point on the north side of the channel opposite Carnegieska Factory.

Lights.—A flashing light with white and red sectors is exhibited at Ryanabbe, but it is only shown between 6th July and 6th June.

Dolphins, showing flashing white lights, are situated on the north side of the channel at Ryanäs, Pölsebo, and Eriksberg.

Dangers.—The following danger on the north side is marked by a buoy:

Hulkebåden, a shoal with 2 fathoms water over it, which lies 350 yards northward of Brännäsbrate, by a red spar buoy, surmounted by two balls, with an upturned broom between.

Depth.—The least depth in the dredged channel to Göteborg is 24½ feet.

Anchorages.—A vessel could anchor in a depth of about 8 fathoms about 800 yards northeastward of Brännäsbrate, and if intending to proceed to this anchorage instead of anchoring in Vinga Sund, after passing 200 yards northward of Böttö Light it should be brought in line with Buskär Light, bearing 244°, and used as a stern mark, steering 64°, and anchoring with Buskär Light a little open northward of Böttö Light.

Anchorage may also be taken up between Gefveskär and Knippelholm in a depth of 7 fathoms, over clay.

Tugs.—There are about 50 tugs at Göteborg, ranging from 3 to 75 horsepower.

Pilots are stationed at Långedrag.

Directions.—From about 200 yards northward of Böttö a 75° course, following the pecked line on the chart, leads between Brännäsbrate and Hulkebåden, and southward of a 4¾-fathom patch which lies about 200 yards southward of Gefveskär, and when that lighthouse bears 341° the course should be altered to 51°, which leads northwestward of Kuskärsbåden and Svinholmsgrund, and when

past the latter the track for vessels entering is southward of Hunnebåden, which may be left on either hand, but to lessen the risk of collision outgoing vessels pass northward of that shoal.

When within that shoal, the light pillars at Carnegieska factory in line, bearing 80°, lead up to the entrance of the dredged channel, which is 160 yards in width, but should not be navigated without a pilot.

Northern entrance.—The northern entrance is entered on the east side of Dana Fiord, between Måkholmsbåde, on the south, and Stora Måkholm and Måkholms Skären, on the north, and is about 800 yards broad at its western part, gradually narrowing eastward.

Skalkorgarne, an islet or rock, is situated on the northern side of the channel about 1 mile eastward of Stora Måkholm.

Light.—A white tower on Skalkorgarne exhibits, at an elevation of 16 feet above sea level, an unwatched flashing light, with white, red, and green sectors; the white light is visible 9 miles, the red light 7 miles, and the green light 6 miles.

Dangers.—The dangers on the south side are marked by beacons and buoys, for which see the chart. On the northern side the various islets constitute the only dangers.

Anchorage.—Rifö Fiord has anchorage for a number of vessels in depths of from 6 to 8 fathoms, with good holding ground, and sheltered from all winds; the best anchorage for a large vessel is in 6 fathoms water, with Knippelholm Lighthouse bearing 53° and Dynan Beacon 283°.

Anchorage is prohibited in the channel of Alfsborgs Fiord.

Directions.—Skalkorgarne light-tower between the bearings of 78° and 82°, or the light showing white, leads up the western part of this channel, and an 86° course passes southward of Skalkorgarne and Knippelholm (see pecked line on chart) until Carnegieska factory light pillars are in line bearing 80°.

Port.—The port in the Göta Älf, fronting the old town, has depths of from 17 to 24½ feet up to the first bridge, and about the same alongside the stone quays on the south side, as far as Barlastplatsen. On the northwest or Hisingen side there are a number of wharves.

The Stora Bommens Hamn is the starting place of the seagoing and coasting steamers, and northward of it is the customhouse and jetty, while farther north is Lilla Bommens Hamn, the place of departure of the canal steamers.

An extension of the port at Sannegardshamnen is in course of being carried out, and stone quays are constructing on each side of it 900 feet in length; it will be dredged to a depth of 26 feet, and is for the use of vessels discharging cargo in bulk.

The dredged channel to the port, with a depth of 24½ feet, is kept open during winter by ice breakers.

Lights.—From a pole on the northern end of the pile work near Safveäns outlet, at an elevation of 13 feet, a group flashing electric light, with white and red sectors is exhibited.

The following lights are also shown:

On the southern dolphin of the Göteborg North Breakwater a flashing red electric light, and on the western dolphin of the same breakwater a group flashing red electric light.

From the west breakwater a group flashing white electric light.

A flashing white light from Lindholmen and Eriksbergs mechanical works.

These are all exhibited from July 6 to June 6.

Göta Canal.—The canal from Göteborg to the Baltic has a total length of 220 miles, including its connections, and in its artificial part, 87 miles in length, has a width of 46 feet at the bottom, 86 feet on the surface, and a depth of 9¾ feet. At Viken Lake it attains a height of about 300 feet above sea level.

There are 74 locks, each 116½ feet in length, 23 feet in least width, and having a depth of 9¾ feet over the sills; four of these are used for regulating the water level. More than 30 bridges, which open to allow the passage of vessels, cross the canal. The dimensions of the largest vessel that can navigate the canal is about 105 feet in length, 21½ feet beam, and having a draft of 9 feet.

The speed of steamers in the canal being limited to from 4 to 5 knots and in the lakes to from 7 to 9 knots, the passage through occupies about 2½ days.

Time signal.—A time ball, situated at the School of Navigation at an elevation of 138 feet above the water and 69 feet above the ground, is hoisted at 12h. 55m. 0s., lowered halfway at 12h. 58m. 0s., and dropped at 1h. 0m. 0s. mid-European mean time, corresponding to noon Greenwich mean time. It is not visible from the anchorage at Rifö Fiord. The signal is made on Tuesdays, Thursdays, and Saturdays.

Ice signals are made at the pilot captain's office.

Storm warnings are also posted on a notice board at the same office.

City.—Göteborg (Gothenburg) which, next to Stockholm, is the largest commercial city in Sweden, lies on a rocky site on a broad plain on the southeast side of Göta Älf, and was founded in 1619 by Gustavus Adolphus. It is the residence of the Landshöfding of the Län and of a United States consul, and has a population of 173,875 (1912).

The old town, on the northern side, separated from the new town by a moat, was intersected by canals built by the Dutch, but the

smallest of these have been filled and converted into streets. The old town contains an exchange, the Rådhus, built in 1670, a museum, and other buildings, and in the northern part is the Roman Catholic Church, in the center the cathedral, and in the southern part the English Church.

Bridges cross the moat, and there are several suburbs.

Masthugget, the western suburb, contains numerous factories, and southeast of it is Skansen Kronan, a hill where is a massive tower with a conspicuous gilded crown and used as an artillery museum. The residential quarter is southeast of Kungspark, one of several public grounds.

Communication.—Steam vessels run from London, Hull, Harwich, and Grimsby to Göteborg every week, and fortnightly from Hartlepool during the season, and there is steamer communication with Copenhagen and Christiania twice weekly, with Lübeck three or four times weekly, and with Frederikshavn daily. There is direct steamship communication with Australia, South America, South Africa, and the East Indies. There is a line of steamers running to the Levant.

Small steamers run frequently to various places in the vicinity, and the canal steamers ply to Trollhättan and through the canal.

Railway communication with Stockholm, distant 274 miles; with Venersborg and Lake Vänern, about 52 miles; also to Särö, Alfvesta, Skara, and Gössäter; and to Varberg and other ports on the coast. The Stockholm station is central, but those of other lines are somewhat farther away.

There is telegraphic communication with all parts, and a service of electric trams in all the principal thoroughfares. The post office is at Skeppsbro, and the telegraph office at Vestra Hamngatan.

Telegraph station.—A radio telegraph station, situated near Nya Varfvet, is open from 7 a. m. to 9 p. m.; the call letters are G. S. G.

Harbor regulations.—Special harbor regulations are in force, a printed copy of which should be obtained from the port authority.

Coal and supplies.—About 11,000 tons of coal are kept in stock by private firms, and 30,000 tons by the Government, and about 660,000 tons are imported annually. Coaling is carried on by means of baskets and lighters, of which latter there are about 1,500, holding from 35 to 70 tons, and 200 tons might be put in each bunker in 24 hours, but west and southwest winds may interfere with operations if coaling in the roads.

Fresh provisions are plentiful, and the water, which can be obtained from a tank vessel, is good.

Docks and patent slips.—

Name of dock.	Length.		Breadth of entrance.	Depth at H.W.C.S.		L ting power.	Date. built.	Remarks.
	On blocks.	Over all.		On sill.	On blocks.			
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Tons.*		
Lindholmen's..	400 (on floor).	.....	58.....	19½.....	19½	.....	1875	
Patent slips:								
Lindholmen's No. 1.	220 (cradle)..	.....	38 (cradle)...	Forward..	7	1,000	1895	
				Aft.....	18			
Lindholmen's No. 2.	186 (cradle)..	.....	34 (cradle)...	Forward..	7	800	1855	
				Aft.....	15			
Göteborg No. 1.	225 (cradle)..	.....	37 (cradle)...	Forward..	9	1,500	1878	*Göteborg.*—Two other, but smaller, slips.
				Aft.....	18			
Göteborg No. 2.	195 (cradle)..	.....	37 (cradle)...	Forward..	6½	600	1878	
				Aft.....	13			

Repairs.—Large repairs to any hull can be effected at two machine shops; there is a small steam hammer and shears; will lift 30 and 50 tons.

Trade.—The chief exports are iron ore, iron, steel, and timber; machinery and farm and dairy produce are also exported. There are numerous iron, steel, and engine works, cotton factories, breweries, sugar refineries, and shipbuilding works. The imports are chiefly coal and coke, feeding stuffs, fertilizers, machinery and implements, petroleum and naphtha, salt, spirituous liquors, and wines.

Islands.—Extending for a distance of about 5½ miles in a southerly direction from the south side of Hake Fiord are Brännö, Styrsö, and Vrångö, three comparatively large islands; Galtö, Känsö, and Vargö, forming the eastern side of the main entrance to Vinga Sund, being on the west side of the first-named island.

On the eastern side of Brännö and Styrsö are Rifö, Asperö, Köpstadsö, and Donsö, forming the western side of the inner channel, which passes through Askims and Klefva Fiords.

Känsö Hamn, on the north side of Känsö, and 2½ miles east-southeast of Buskär, affords anchorage and has rings placed in the rocks for mooring; it is entered southward of Flata Brunskär and Tannskären and northward of Fjärskarsbåden and Suggbåden, and the entrance may be recognized by the tower on Känsö and Känsö Fjärskär Beacon.

Känsö Hamn is used as a quarantine anchorage; another anchorage for that purpose suitable for large vessels is eastward of Asperö and Köpstadsö.

Dangers—Beacon and buoys.—Känsö Fjärskär Beacon and Fjärskärsbåden Buoy have been already described.

The following are marked by beacons or buoys:

Suggbåden, southward of Tannskären, by a black spar buoy, surmounted by a ball.

Galten, situated in the middle of the channel, east-southeast of Tannskären, has a rock with a depth of 2½ fathoms over it 200 yards west-northwest of its northwest side, which is marked by a plain spar buoy.

The shoals on each side of the harbor are marked by spar buoys; on the north by four spar buoys surmounted by brooms, and on the south side by two plain spar buoys.

Depths.—The depths in the entrance channel are from 4¾ to 10 fathoms, and from 5 to 7 fathoms at the anchorage.

Pilots may be obtained at Vinga, and in the daytime from Brännö or from Yttre Tistlarne.

Anchorage.—The best anchorage is in from 5½ to 6½ fathoms water, over clay, with Känsö Tower bearing between 194° and 205°.

Directions.—Steer about 85° for the north end of Känsö, following the pecked line on the chart, passing between the south point of Tannskären and Suggbåden black spar buoy, and having passed the latter, steer about 56°, to pass between Tannskären and the buoy marking the rock west-northwest of Galten, and rounding that rock, keep to the east-southeastward between the buoys marking the shoals on each side of the harbor, keeping rather nearer the northern side to avoid the shoal extending northward of Känsö.

Communication.—Känsö is a telephone station.

Water.—Excellent water can be procured.

Anchorages—Vargö Håla.—There are several anchorages between the islands and rocks in this vicinity, and the next to the southward of Känsö Hamn is Vargö Håla, which is situated off the north point of Styrsö.

It may be entered between Flata Brunskären and Fjärskärsbåden, and thence between Känsö Fjärskär and Suggbåden and Känsö and Vargö, or southward of Hästbåden and through Klapphamns Inlopp, between the southeast side of Vargö and Styrsö. Vessels that have undergone quarantine sometimes anchor here, and if remaining any time it is necessary to moor, for which purpose there are rings on both sides.

Depths.—The least depth in the northern channel is about 5¾ fathoms, and in the southern 3¾ fathoms, and there are from 5½ to 6½ fathoms over clay at the anchorage.

Räfholm Anchorage, northward of that island, is suitable for small vessels, having depths of from 10 to 12 feet; there is also an anchorage eastward of the same island.

Between Styrsö, Donsö, and Vrångö are several openings, leading to the Southern Inner Channel.

Maholm is an islet situated about ⅜ mile westward of the north point of Vrångö.

Light.—An occulting light with white, red, and green sectors is exhibited, at an elevation of 31 feet above high water, from an iron stage, 7 feet in height, on Måholm; it is an unwatched fishing light, shown from the 1st September to the 1st May.

Stora Stenskär is a small rock situated about 1 mile southward of Måholm and the same distance westward of the south point of Vrångö, on the south side of the entrance to Kungsö Sund; a safe anchorage, with depths of from 6 to 8 fathoms, is between the south point of Vrångö and Kungsö.

Beacon.—A cairn beacon with a black band marks Stora Stenskär.

Tistlarne consists of two groups of rocks about 600 yards apart in a northeast and southwest direction. Yttre Tistlarne, the southwestern, outer, and larger group, consists of some low and very black rocks, on the largest of which is a pilot's house, painted red. The rocks are surrounded by breakers, and for some distance by detached shoals.

Light.—On the southwest rock is a yellow building 46 feet in height resembling a castle, with a flat roof, which exhibits, at an elevation of 75 feet above sea level, a group occulting white and red light; in clear weather it should be visible from a distance of 14 miles.

Fog signal.—See Light List.

Pilots.—Yttre Tistlarne is an attendance place for Vrångö pilot station.

Vanguardsgrund, the outer danger in this locality, lies 2 miles 303° from Yttre Tistlarne, is of small extent, and has a depth of 2¾ fathoms over it; there is a depth of about 11 fathoms close northwestward of it, and midway between it and Yttre Tistlarne is Snyltebåden, with 1 fathom water over it, and depths of from 4¾ to 24 fathoms between it and Vanguardsgrund, and 17 fathoms between it and the islands.

Buoy.—The western side of Vanguardsgrund is marked by a red spar buoy, surmounted by a down-turned broom over a ball.

Clearing marks.—Stora Rös in line with Måholms gapet, the channel between Amundskären and Måholm, bearing 41°, leads northwest of Vanguardsgrund.

Matskär Beacon in line with the southern side Yttre Tistlarne, bearing 98°, leads southward of Vanguardsgrund and Snyltebådan.

By night the eastern limit of the fixed white sector of Böttö light, bearing 21°, leads westward, and the northern limit of the white sector of light from Yttre Tistlarne Lighthouse, about 107°, leads southward of both shoals.

Dangers southeastward of Yttre Tistlarne.—Matskär is an islet or rock lying about a quarter of a mile east by south of the east end of Yttre Tistlarne, and Matskärsbåden, a rock with a depth of 3 feet, which breaks and is steep-to, lies fully half a mile from Matskär

in the same direction. Grundaberg, with 2¼ fathoms water over it, is about 700 yards from Matskärsbåden on the same line.

Knaltarne, with a depth of 2¾ fathoms over it, lies about 1 mile southward of Matskär, with Karraberg, on which there is 2½ fathoms water, midway between it and Grundaberg.

Beacons and buoys.—Matskär is marked by a black stone beacon, 20 feet high, with a white band.

Matskärsbåden is marked on its western side by a red spar buoy, surmounted by a ball and down-turned broom.

Knaltarne is marked on its northwest side by a red spar buoy, surmounted by three down-turned brooms.

Lilla, Yttre, and Inre Viten, lying from 1¾ to 2¾ miles southeastward of Yttre Tistlarne, are three sunken rocks, which break with little motion and are steep-to, of which Lilla Viten, with 1½ fathoms water over it, is the western. Other patches in their vicinity will be seen on the chart.

Western side of the Inner Channel.—Varö, about 800 yards eastward of Kungsö and the same distance southward of Vrångö, is the southeast island of the group which forms the outer side of the Inner Channel. It has several smaller islands on its north-northeast and opposite side.

Lights.—On the southeast side of Varö a white tower 37 feet in height, with a dwelling, exhibits, at an elevation of 46 feet above sea level, a fixed and flashing light, with white and red sectors. (For bearings of sectors see Light List.)

From the window of the north gable of a house on Varö a white fixed light is exhibited at an elevation of 45 feet above sea level. It should be seen from a distance of 12 miles, but shows only in the fairway to the northward toward Rättaren.

Varö Anchorage, between Varö and Kungsö, is an anchorage with depths of from 7 to 9 fathoms, over clay, where vessels are well sheltered, except in a heavy south-southwest gale, when some sea would be experienced. It may be entered from the westward between Lökholmar and Stora Stenskär and from the northeastward between Vrångö and Vallholm.

Rättaren is a rock lying 1½ miles northward of Varö, and about ⅓ mile eastward of Vrångö. Shoal water extends a short distance southeastward of the rock, and a shoal with a depth of 1 fathom lies 400 yards 216° from it.

Light.—From a lantern at the corner of a white house on Råttaren a flashing white and red light is exhibited at an elevation of 18 feet above sea level; the white light, which indicates the fairway of the channel to the southward, is visible 9 miles, and the red light 6 miles, but the light is unwatched.

Donsö, an island about 1 mile in length and ¾ mile in breadth, is situated about ⅜ mile northward of Rättaren; it has two smaller islands off its northeast side, and northward of these is the eastern entrance of Klapphamns Inlopp and Vargö Håla.

From this to the northward, the western side of the inner channel is formed by Köpstadsö, Asperö, and Rifö.

Light.—On the eastern side of Rifö, from a lantern on a white house, a flashing light with white, red, and green sectors is exhibited at an elevation of 6 feet above sea level; the white light is visible 7 miles, the red light 6 miles, and the green 5 miles. The light, shown from 6th July to 6th June, is unwatched.

Eastern side of the Inner Channel.—Riseberget, a shoal with a depth of 2¼ fathoms over it, and the southernmost danger on the eastern side of the Inner Channel, lies nearly 2½ miles eastward of Yttre Tistlarne.

About 1¼ miles northeastward of Riseberget are patches of from 2¼ to 3¾ fathoms.

A shoal with 1½ fathoms over it lies 278° 700 yards from north extreme of Riso.

Buoy.—A black spar buoy with a white band and surmounted by a ball is moored on the northeast side of Riseberget.

Arna, a small rock above water, lies about 1,400 yards eastward of Varö Lighthouse, and has a shoal with 2¾ fathoms water over it about 200 yards southeastward of it.

Fjorholm and Fjorholmskären, a group of islets and rocks, are situated about 1,600 yards northward of Arna, and off their western side are several shoals, of which Vallholmsbåden, the western, is close to the eastern side of the channel.

Buoy.—Vallholmsbåden is marked on its western side by a red spar buoy, surmounted by a ball over a down-turned broom.

Erskär, 1¼ miles farther north, is a rock about 600 yards eastward of Rattaren; Erskärsbåden, on which the depth is about 2 feet, is nearly a quarter of a mile southwestward of Erskär, with a shoal on which the depth is 1½ fathoms between.

Buoy.—Erskärsbåden is marked on its western side by a red spar buoy surmounted by a down-turned broom.

Rödskär, two small islets, lie ⅜ mile northeastward of Erskär, and about a quarter of a mile northwest of Rödskär is Yxen, a rock above water; a shoal lies about 200 yards northward of Yxen.

Buoy.—A spar buoy surmounted by an upturned broom is moored on the western side of the shoal northward of Yxen.

Kråko and Hafgalleskär are small islets surrounded by shoals which stretch from half to nearly 1 mile northward of Rödskär, and on their western sides is a line of four shoals, in a north and south direction. Klefvagrund is a shoal about 600 yards northward of

Hafgalleskär, and 400 yards northward of Klefvagrund is a shoal with a depth of 3¾ fathoms.

Buoys.—The southern of the four shoals above mentioned is marked on its western side by a spar buoy with two down-turned brooms.

The three other shoals are marked on the west side by red spar buoys with upturned brooms.

The shoal extending northward of Hafgalleskär is marked by a spar buoy with an upturned broom.

Klefvagrund is marked on its west side by a spar buoy with an upturned broom.

Stora Knarrholm, an island about ½ mile in length, is situated about 1 mile northward of Hafgalleskär, and Sillfarsholm and Hårskär are two islets off the northeast end of Stora Knarrholm; shoal water, with depths of from 2¼ to 3¼ fathoms, extends about 800 yards northward of Sillfarsholm.

Light.—A group flashing light, with white and red sectors, is exhibited, at an elevation of 13 feet above sea level, from a house, painted white, on the southwest point of Stora Knarrholm; the white light is visible 9 miles and the red 6 miles, but it is unwatched and only shown from 6th July to 6th June. (For sectors see Light List.)

Buoy.—A shoal which extends from the southwest point of Stora Knarrholm, near the lighthouse, is marked on its western side by a spar buoy surmounted by an upturned broom.

Beacon.—A white spar beacon stands on the north extreme of Stora Knarrholm, and there is a white cairn about 100 yards southward of it; these are for use when anchoring in the quarantine anchorage. (See below.)

Skifteskär is an islet situated 800 yards eastward of the northeast point of Asperö, and a shoal, with a depth of 2 fathoms over it, lies 200 yards northeastward of the same point.

Beacons and buoys.—Between Sillfarsholm and Skifteskär are the folowing shoals, all in a northerly direction from the former island at the distances given. Skifteskär is marked by a white cairn beacon.

A shoal, with 1 fathom water, at 1,200 yards, is marked on its western side by a spar buoy, with an upturned broom.

Rödskarsbåden, at about 1,400 yards, is marked on its western side by a spar buoy, surmounted by two upturned brooms.

A shoal, with a depth of 1¼ fathoms at 1 mile, has a spar buoy, with an upturned broom on its western side.

Loggera, a cluster of rocks, lies 600 yards northwestward of Skifteskär, and a shoal with less than 1 fathom water over it lies close southwestward of Loggera.

Gulldisken is a rock lying about 200 yards eastward of the east point of Rifo, opposite the lighthouse.

Buoys and beacons.—The shoal southeast of Loggera is marked on its western side by a spar buoy, surmounted by an upturned broom, and a spar beacon stands at the northeast point of Loggera.

Gulldisken is marked on the western side by a red spar buoy, surmounted by a triangle and upturned broom, and on the northeast side by a spar beacon.

Kråkskären consists of a cluster of rocks nearly 800 yards eastward of the north point of Rifo, and on the southeast side of Rifo Fiord.

Depths.—The least depth in the channel is 6 fathoms.

Anchorage may be obtained in depths of from 7 to 8 fathoms eastward of Vrångö, protected from all winds except those from the southward, which may cause a swell; a rock with a depth of 2 fathoms over it, lyong nearly 400 yards off the east coast of Vrångö must be avoided.

Quarantine anchorage.—The quarantine anchorage for large vessels is in a space which is formed on the south by lines joining an islet north of Långholm and the north point of Stora Knarrholm, thence to the north point of Sillfarsholm, and from that to the north point of Håskär. The west side is a line joining the small islet northward of Långholm with the northeast extreme of Asperö, the east side being a line from the north point of Hårskär to islets southwest of Eskholm.

Eskholm is on the northeast side of the area, and from the islets southwest of it, a line to the south point of Skifteskär, continued to the northeast extreme of Asperö, forms the northern boundary of the anchorage.

Large vessels should anchor with the beacon and cairn on the north point of Stora Knarrholm in line, but anchorage is prohibited in the white sectors of either Stora Knarrholm or Rifö Lights.

Directions.—Approaching from the southward when about 2 miles southward of Yttre Tistlarne bring Matskär Beacon in line with Stora Rös, bearing 13° and steer on this mark, which leads about 1,200 yards westward of Knaltarne, eastward of Lille Ryggen and passes about 2,000 yards eastward of Matskär.

From abreast Matskär a 47° course, with Knallskär, a small rock southwest of Matskär, shut in by that islet, on the opposite bearing, and used as a stern mark, leads between the 2¾-fathoms shoal, northward of Matskärsbåde, and the 1½-fathoms shoal 148° of Inre Tistlarne, and when Vinga Lighthouse and Beacon are in line with the southwest side of Kalfholm, bearing 317°, alter course to about 22° to pass eastward of Varö Lighthouse; the first course leads between

a 3-fathoms patch on the starboard and two 4¾-fathoms patches on the port hand, lying about ¾ mile eastward of Inre Tistlarne.

Round the southeast side of Varö at a distance of about ½ mile and steer 357° with Rättern Lighthouse ahead, passing between Vallholm and Vallholmsbåden, and as Rättaren is neared steer to pass about 200 yards east of it, leaving the red buoy on Erskärsbåden on the starboard hand; the channel here is only about 150 yards wide.

Having passed Rätteren steer about 28° and pass about 100 yards off Donsö Hufvud, with the buoy marking the shoal northward of Yxen on the starboard hand, and then keep to the northward along the east side of Sillskär, leaving the buoys marking the shoals westward of Kråkö and Hafgalleskär on the starboard hand and having Stora Knarrholm Lighthouse nearly ahead.

Pass westward of the buoy marking the shoal southwest of Stora Knarrholm Lighthouse, and through the channel between Stora Knarrholm on the east and Brustholm and Långholm on the west, the course then being about 349°, through the quarantine anchorage and between the northwest point of Asperö and the 2-fathom shoal which lies eastward of it.

The course is then along the east side of Rifö, leaving the buoy marking the shoal southwest of Loggera and that marking Gulldisken on the starboard hand and passing about 100 yards eastward of Rifö Lighthouse, from which a 4° course leads westward of Svinholmsgrund, and the directions may be followed.

There is a route for vessels of less than 12 feet draft passing eastward of Skifteskär, westward of Smorbo, and along the west coast of Långedrag, which is shown by a pecked line on the chart.

By night.—The white sector of Stora Knarrholm Light, between the bearings 5° and 7°, leads westward of Riseberget, and the white sector of Rattaren Light, between 350° and 359°, leads up the channel to that rock between Vallholm and Vallholmsbo, while the western limit of the northern white sector from Rättaren, bearing about 213°, clears the dangers on the west side southward of Donsö and leads to Donsö hufvud, after passing which the white sector of Stora Knarrholm, between 167° and 169°, again leads up the channel.

The sector of white light from Rifö, bearing between 340° and 346°, leads through the Quarantine Anchorage to that light, and after passing it the white sector from the same, to the northward, between 175° and 185°, leads northward of Rifö Fiord, its eastern limit leading westward of Svinholmsgrund.

The directions for entering from the southward at Nidingen are given below.

Storm warnings are posted up at Länge Drag.

Särö, an island about 1 mile in an east and west direction, lies in a bight about 6 miles east of Yttre Tistlarne and is connected to the mainland by a bridge; it is high, covered with wood, and on its summit is a pavilion, and on high ground to the eastward of it may be seen Vallda and Onsala churches, the former, about 2¼ miles southeastward of Särö, being conspicuous from its high spire, and the latter white with red tiles and a low white tower, with a black spire at its western end.

Kedholms Hamn, northwestward of Särö, may be entered by Kedholm Sund, a narrow channel from the southward, or from the northwestward, and affords anchorage in from 3¾ to 5 fathoms over clay. The depths in the northern approach are from 5½ to 8 fathoms and in the southern 5 to 5½ fathoms.

Approach—Dangers.—Kedholms Hamn is approached from the northward or from the southward, as shown by the pecked line on the chart.

Tranebräcka, a small black rock, with others south of it, is situated nearly 4 miles southwest of Särö, and is on the southern side of the approach; a shoal, with a depth of 1½ fathoms, lies about 200 yards westward, and another of 1 fathom about 600 yards eastward of Tranebräcka. A patch with a depth of 4½ fathoms lies 800 yards northward of Tranebräcka.

Hosholmsberg are three shoals, the two western having a depth of 1½ fathoms, and the eastern 1¼ fathoms; they lie about 1¾ miles east-northeast of Tranebräcka, on the northern side of the approach.

Hosholmarne and Myra are islets lying from a quarter to two-thirds of amile off Vallda Sandö, the west point of Sandönäs, and northward of them are several islets and shoals, the nearest of these to the track, on the western side, being Gulaskär, nearly ½ mile southward of the entrance to Kedholms Sund.

Pilots may be obtained at Yttre Tistlarne and at Mönster.

Directions.—Steer about 80°, to pass northward of Tranebräcka and heading somewhat to the northward of Vallda Church, until the south side of Vallda Sandö bears 56°, when the pavilion on the summit of Särö in line with the northwest extreme of Vallda Sandö, bearing 40°, will lead southeastward of Hosholmberg and Myra, from which a 14° course will lead to the entrance of Kedholms Sund, thence passing through it to the anchorage.

A vessel may also steer to pass northward of Hosholmsberg and between Hosholmsberg and Myra. (See pecked line on chart.)

Anchorage.—The anchorage, in from 3¾ to 5 fathoms water over clay, is about ⅓ mile northeastward of the north point of Kedholm.

Communication.—Särö has post, telegraph, and telephone offices.

Islets and dangers.—From Tranebräcka a line of islets or rocks, with several dangers, extends in a southerly direction, for about 6½

miles, forming the western side of an inner channel, entered from the southward, westward of Malö.

Kungen, small rocks about ½ mile south of Tranebräcka, have a 2¾-fathom patch close northeast and a shoal of 5 fathoms about 600 yards southwest of them.

West and East Rön lie 1¾ miles southward of Kungen and Lypskärsgrunden, several shoals, some of which are awash, extend for about northward of the Rön Islets; a shoal of 4½ fathoms lies about 1¼ miles southwest of the islets, with other shoals between.

Svartskär is situated about 2¾ miles southward of the Rön Islets, and between are Rösera, awash, and a 1¾-fathoms shoal; Torgö, with a depth of 2 fathoms; and Flintskall, with 1½ fathoms.

Fjarehalsbåde, on which the depth is 2 fathoms, lies 1,200 yards southwest of Svartskär.

Grundabådea, a shoal with 4 feet water over it, is the southern of this line of dangers, and has a 4½-fathoms patch about ½ mile northward and one of 4¾ fathoms the same distance southwest of it.

Buoy.—A red spar buoy surmounted by a down-turned broom is moored about 400 yards 194° from Grundabåde.

The dangers in the inner channel will be mentioned hereafter.

Öckerö Sund, nearly 6 miles southward of Vallda Sandö, is fronted by Långskär and Stensholmar, and has a space of about ¾ mile east and west, by about 800 yards north and south, in which the depths are from 3¾ to 6 fathoms; the south side of the sund is formed by Öckerö. It affords good anchorage, and is entered by Breda Gapet on the southwest side, but winds between southwest and west-southwest send in some swell.

Dangers.—Two shoals, the southern with a depth of 3¼ fathoms over it, lie about 400 yards 216° of Stensholmar on the north side of Breda Gapet.

Bredakråkor, a small dry rock, lies on the south side of the entrance to Breda Gapet, with several islets eastward of it.

Beacon.—Bredakråkor is marked by a white stone beacon 8 feet in height with a red band.

A shoal, with a depth of 5 fathoms over it, lies 200 yards 328° of Bredakråkor Beacon.

Depths.—There is a depth of 6 fathoms in Breda Gapet, avoiding the 5-fathoms shoal.

Pilots may be obtained at Mönster.

Directions.—When about 2½ miles southwestward of the prominent rock Svartskär bring the loftily situated church of Onsala over the middle of Breda Gapet, bearing 60°, which mark leads between Fjärehalsbåde and Grundabåde, and when approaching Breda Gapet bring Råå Magazine in line with a small hillock northward of a mill, bearing 58°, which mark will lead southward of the 3¼-fathoms shoal

southwestward of Stensholmar and through the pass to the anchorage.

Anchorage.—The anchorage in from 3¾ to 5 fathoms, over clay, is about 400 yards northward of the eastern of the islets, northward of Öckerö; a small vessel will find more shelter and better holding ground close in.

Malö, 1¼ miles in length, in an east and west direction, is very low, barren, and of a yellowish hue, by which it may be known, as well as by its lighthouse on the south point and by three small piles of stones, erected close to each other, on its highest part. Shoal water, with depths under 5 fathoms, extends nearly ½ mile from its western extreme, and the southern and southeastern sides are foul.

Light.—From an octagonal white iron building situated on the south point of Malö an unwatched group flashing light with red and green sectors is exhibited at an elevation of 16 feet above sea level; the red light should be visible, in clear weather, from a distance of 9 miles and the green light from 7 miles, but the light is discontinued when navigation, within the range of the light, is obstructed by fixed sea ice.

Dangers.—Kakkebåde, or Kaggebåde, northwestward of Malö, is described below. A shoal, with 3¾ fathoms water over it, lies about 1,600 yards westward of the west end of Malö.

Bredaberg, about 1,600 yards westward of Malö Lighthouse, is a shoal about ¼ mile in length, with 2½ fathoms water over it; about 800 and 1,200 yards westward of Bredaberg are shoals of 3 and 3¾ fathoms, respectively. The water is shoal between Bredaberg and the lighthouse.

Inner Channel.—The southern part of the Inner Channel mentioned above is entered southward of Grundabåde, and passing inside the line of islets and dangers, already described, has a northerly direction, at about 1 mile from the coast and its islands.

Dangers.—Kakkebåde, a shoal with a depth of 3 feet over it, lies about 1.2 miles northwestward of Malö, and has a patch with a depth of 2¾ fathoms, about 300 yards westward of it.

South Vassaberg and Vassaberget, two shoals, with depths of 4¾ and 2½ fathoms, respectively, are situated 1⅞ and 2 miles 14° of Svartskär.

About 1,800 yards northward of Vassaberget is a shoal with 2¾ fathoms water over it, and about the same distance 14° of this shoal is Stora Såten, on which the depth is 2½ fathoms; between there is a patch of 3¾ to 4½ fathoms.

Snäcka is an islet about 1 mile off the coast, and northward of it are three shoals, named Ryggen, Hvitehall, and Hålleberg. Hvitehall, the western, has a depth of 1¼ fathoms.

Buoys.—The western side of the 2¾ fathoms shoal, westward of Kakkebåde, is marked by a red spar buoy, surmounted by two down-turned drums.

Vassaberget is marked on its eastern side by a black and white spar buoy, surmounted by a ball.

The 2¾-fathoms shoal, northward of Vassaberget, is marked, on its eastern side by a black and white spar buoy, surmounted by two balls.

Directions—By night.—The fixed white sector of light from Varö, between the bearings of 345° and 347°, leads up this channel, but over the 3¾-fathoms patch mentioned south of Stora Såten; it also leads eastward of Riseberget, and up to Varö, when the directions already given for the northern part of the Inner Channel may be followed.

Malö Hamn, an indentation about ⅔ mile in length, north-northeastward of Malö, is a well-sheltered anchorage, as in addition to Malö, which affords some protection from the southwestward, the entrance is fronted by Risholm and other islets, but south and southwest winds still send in some swell.

It may be entered, from the westward, through Malö Sund, between Malö and Mönster Udde, or from the southward between the same island and Hållsunds Udde, and may be left by a sailing vessel with all winds from southeast, round by east and north, to west.

Depths.—Malö Sund has a least depth of 4¾ fathoms, and the southern entrance about 9 fathoms, but the depth in the entrance to the hamn is only 3¾ fathoms and from 4 to 5 fathoms at the anchorage.

Beacons.—On Hållsunds Udde is a pole beacon 59 feet in height and 108 feet above sea level; it is surmounted by a white board.

A white stone beacon marks the eastern end of a group of rocks, southeastward of Risholm.

Buoys.—In Malö Sund the southern extremes of a shoal extending from an islet westward of Lygnholm, and of a shoal extending from Bockholm, are marked by spar buoys surmounted by brooms, but these buoys are sometimes run under water by a strong current through the sund.

The western extreme of the shoal extending westward of Risholm is marked by a spar buoy, with a broom.

The shoal extending southeastward from the group of rocks, eastward of Risholm, is marked by a spar buoy.

Pilots.—Mönster pilot station is situated at Mönster Udde, and pilots may be obtained for Malö Hamn, as well as other places in the neighborhood; pilots for these anchorages may also be procured at Varberg.

Directions.—Hållsunds Beacon, kept rather on the northern side of mid-channel of the Malö Sund, bearing 102°, leads between Fjarehalsbåde and Grundabåde (see pecked line on chart), and when West Rön opens eastward of Svartskär bearing about 341°, the beacon should be brought in line with the north extreme of Malö, 96°, to pass southward of Kakkebåde.

When Bredakråkor Beacon is in line with the west side of Hasleskären, bearing 345°, steer to pass about 400 yards northward of Malö, and southward of the spar buoys marking the extreme of shoals on each side of Lygnholm.

Having passed the eastern of the spar buoys, alter course for the southeast side of Skallanäs, passing eastward of a white beacon marking the southeast rocks of Risholmsflu, the group of rocks in the entrance, eastward of Risholm, and rounding these, steer to the northwestward to the anchorage.

To pass southward of Grundabåde and Kakkebåde, steer 78°, for Mönster Udde, until Hallsunds Beacon comes in line with the northern side of mid-channel of Malö Sund, 102°, and proceed as before directed.

For the southern entrance, Fjordskär Lighthouse open eastward of Hållsunds Udde, bearing 36°, leads southeastward of Bredaberg, and Skallanäs may be steered for 9°, passing westward of Ingolsbåden, a small islet with a shoal extending southward of it, off the west side of Hållsunds Peninsula, and eastward of the beacon marking the southeast extreme of the group of rocks in the entrance.

Anchorage.—The anchorage in depths of from 4½ to 5 fathoms is about 400 yards northward of Risholm, the bottom being sand and weeds, over clay.

Current.—The current in Malö Sund is sometimes sufficiently strong to run the buoys under water.

Skalla Hamn, eastward of Malö Hamn, and separated from it by Skallanäs, affords anchorage for small vessels, and has rings on each side for mooring; it is more open to the swell with southwest gales than Malö Hamn.

Directions.—The directions already given will lead to the entrance, and it is only necessary to steer a mid-channel course to the anchorage.

Anchorage may be obtained in depths of from 3 to 3½ fathoms over a grass bottom, covering clay.

Nidingen, about 2½ miles southwestward of Malö, is a remarkable rock, the highest part of which is only 14 feet above sea level; it is about ½ mile in length, in an east and west direction, and 400 yards in width at its broadest part.

The whole of its south side is fronted by rocks and shoal water, extending ½ mile southwest, where it is named Klockfoten; about

¼ mile south and ½ mile from the east point this latter, awash at its extreme, being named Lilleland.

Lights.—On the summit of Nidingen are two gray hexagonal stone towers, 60 feet in height, and 33 yards apart, 52° and 232°; a short distance northward of the lighthouse is the keeper's house, roofed with red tiles.

From the eastern tower a fixed white light, with a fixed red sector over Lilleland, is exhibited at an elevation of 66 feet above sea level, and is visible 14 miles.

The western tower exhibits, at a similar elevation, a fixed white and occulting light, which is visible 14 miles, and shows occulting from 18° to 39° fixed elsewhere.

The light towers form an excellent mark by day, and from the position of the island the lights are of the greatest importance to the navigation of the Kattegat.

Fog signal.—See Light List.

Dangers.—The following dangers are situated around Nidingen:

A shoal, with a depth of 4¾ fathoms over it, lies about 800 yards northwestward of the lighthouses.

Långbådan, a shoal with 4¾ fathoms water over it, is nearly 1 mile southwest of the lighthouses, and about 1,400 yards 214° of the same towers is a shoal of 2¾ fathoms.

Bredaberg, on which the depth is 3¼ fathoms, lies 1.1 miles 150°, and Hafrarefvet, awash, about 1,200 yards 103° of the light towers.

Bellbuoy.—A red bellbuoy, surmounted by a ball, is moored in about 13 fathoms water, nearly 1 mile 211° of the light towers and 600 yards southeastward of Långbådan.

Buoy.—Lilleland is marked on its northeast side by a black spar buoy, with a white band, and surmounted by a ball.

Directions.—The dangers in the channel between Malö and Nidingen are described above, and a 78° course leads through it in mid-channel, observing that Hållsunds Udde Beacon open south of Malö, bearing about 67°, leads southward of Bredaberg (Malö) and the shoals westward of it.

Kungsbäcka Fiord, entered eastward of Hållsunds Udde, stretches in a north by east direction for a distance of 7¾ miles, and from its depth and good holding ground affords excellent anchorage for vessels; the swell sets in with southwesterly gales, decreasing as a vessel proceeds inward, while a sailing vessel will find room to work out in moderate weather.

The western side of the fiord is formed by the east coast of the peninsula, of which Hållsunds Udde is the south extreme, and the east side by a number of islands, islets, and rocks, and two shallow bays; Fjordskär is a rock in the middle of the entrance, but on the

western side of the channel about ¾ mile northeastward of Hållsunds Udde.

Light.—An octagonal iron structure, 19 feet in height, on Fjordskär, exhibits, at an elevation of 33 feet above sea level, an unwatched flashing light, with white, red, and green sectors; the white light is visible 11 miles, the red light 10 miles, and the green light 8 miles. (For sectors, see Light List.)

Dangers.—On the eastern side of the approach are the following: Hultingsgrunden, a shoal about ½ mile in extent, with a least depth of 3¾ fathoms over it, which lies about 2 miles south by east of Fjordskär.

Hogardsgrund, with 5 fathoms water over it, is situated about ⅝ mile northwestward of Hultingsgrunden.

Beacon.—Ramö Rös, a white beacon of stones 10 feet high, stands on the summit of Ramnö, an islet about 1 mile northeastward of Fjordskär, and, being 128 feet above sea level, may be seen from a distance of 12 miles.

Depths.—The depths are from 14 to 19 fathoms in the entrance channel, and from 6½ to 8 fathoms at the anchorage.

Pilots may be obtained either at Mönster or at Varberg.

Directions.—Nidingen Light Towers, Hållsunds Udde Beacon, and the three heaps of stones and the lighthouse on Malö, are all marks for distinguishing the locality, and Onsala Church, on the western side of Kungsbäcka Fiord, 4½ miles from the entrance, is conspicuous, having white walls, a red roof, and a low white tower with a black spire at its western end.

Onsala Church in line with Hållsunds Udde Beacon, bearing 10°, leads to the entrance until Ramnö Rös comes in line with Yttre Lon, an islet south-southwest of it, bearing 31°, when course should be altered on that mark, which leads between Hållsunds Udde and Hogardsgrund, and passing 200 yards eastward of the lighthouse, steer about 16° in mid-channel up the fiord.

By night.—Steer for the entrance in the white sector of Fjordskär light, between the bearings of 3° and 29°, and pass about 200 yards eastward of the light, steering into the northern sector of white light, between the bearings of 196° and 201°, which leads up the fiord to the anchorage.

Anchorage.—The anchorage, abreast Onsala Church, is in depths of from 6½ to 8 fathoms over clay.

Communication.—There is a railway station on the line between Göteborg and Varberg, at Kungsbäcka, at the head of the fiord, and a post and telegraph office at Onsala.

Vendelsö Fiord, southward of Kungsbäcka Fiord, and between Näskroken and Ringhals, nearly 5 miles apart, contains several islands, the anchorages being between Nordstö, the northwestern-

most, and Vendelsö, or between the latter island and the mainland, but they are open to southwest winds, and gales from that quarter send in a swell.

Dangers.—A line of islets, rocks, and shoal patches extends for a distance of 2 miles southwestward of Utstö, the southwesternmost island, the outer danger of these being Södra Ledskär, a rather conspicuous low, black rock.

Depths.—The depths in the entrance channel are from 7 to 10 fathoms, and at the anchorages from 3¾ to 5½ fathoms.

Pilots may be obtained at Mönster and at Varberg.

Directions.—Steer 47° to pass southward of Södra Ledskär, and between it and Ringhals, which course will lead southward of Knarrskär, an islet southward of Vendelsö, and having passed it alter course to the northward for the anchorage eastward of Vendelsö.

Anchorage.—The anchorage, in depths of from 3¾ to 5½ fathoms, is over a bottom of sand and gravel and 600 yards eastward of Vendelsö, with the northernmost buildings on that island bearing 314°; farther north the holding ground is said to be bad, the bottom being covered with seaweed.

Båt Fiord, about ¾ mile southward of Ringhals, is a shallow indentation about 1¼ miles in extent, and anchorage can only be obtained off its entrance, which is open to westerly winds.

Lights.—Two fixed red leading lights for fishermen are exhibited from wooden frames 7 and 9 feet high, respectively, and situated on Krokstaden, the south entrance point to Båt Fiord. The higher light is shown at an elevation of 38 feet, and the lower at 25 feet; they are 34 yards apart, in line bearing 73°, and should be visible in clear weather from a distance of 4 miles.

Anchorage.—Norra and Södra Herta are high islets, and in case of necessity anchorage may be obtained northeast of the former, in depths of from 4¼ to 6 fathoms, over sand, by steering about east, between the islets, and then to the northward, but a reef extending in a southeast direction from Norra Herta must be avoided.

Life-saving station.—A lifeboat and a rocket apparatus are kept at Båt Fiord.

Kloster Fiord, about 3 miles southward of Båt Fiord, extends for about 2½ miles in an east-northeast direction, and is nearly 1 mile wide, but the inner part, from ¾ of a mile from the entrance, is shallow; a rock named Kråkan lies on the western edge of the shoal portion.

Dangers.—Prestskär, an islet, lies about ¾ mile southward of Södra Herta, with a patch on which the depth is 4¼ fathoms, midway between them.

Fjolebåden, awash, is ½ mile east by south of Södra Herta.

Hampsholm and Knarrskär are islets and rocks lying off Lerhufvud, the southern entrance point.

Depths.—The depths are about 7 fathoms in the entrance, and from 3¾ to 4¼ at the anchorage.

Directions.—The fiord is entered southward of Prestskär and between it and Hampsholm, and Lahalls village and mill open southward of Prestskär, bearing 45°, leads in. (See pecked line on chart.)

Anchorage.—The anchorage, in from 3¾ to 4¼ fathoms water over sand and clay, is from 400 to 600 yards southwest of Kråkan, but it is open to westerly winds, and gales from that quarter send in some sea. Anchorage may also be taken up farther up the fiord, in a depth of 2 fathoms, over a similar bottom.

Water may be procured at Lahalls, on the north, or Arnäs village on the south side of the fiord.

Balgö, an island about 1 mile in extent, is situated 1¾ miles southward of Lerhufvud; between it and the mainland the water is very shallow, and seaward of it dangers extend for about 2 miles.

Klåback, moderately high and reddish colored, and the outermost rock in this locality, is situated 1½ miles westward of Balgö. A shoal with 4¼ fathoms over it lies about 800 yards westward of Klåback.

Beacon.—A square white board with a black diagonal band marks Klåback.

Getterö, about 2 miles south-southeast of and somewhat larger than Balgö, is nearly joined to it by shoal water, on which are several islets and rocks; detached shoals extend westward of a line joining the west ends of these islands, the outermost being Fornöt, awash, about 1¾ miles southeast of Klåback. Between Getterö and the mainland the water is exceedingly shallow.

Varberg, a small artificial harbor between two stone piers of which the western is the longer, has a north-northwest direction, its entrance being fronted by Getterö; off the eastern pier, and at about the same distance from it as the end of the western pier, is a breakwater having an east-northeast and opposite direction. The quayage is 3,084 feet in length, with the same depth alongside as in the harbor.

Skrifvareklippan, an island about ¼ mile in length, in a northeast and opposite direction, is nearly 600 yards south of Getterö and ½ mile westward of the harbor.

Lights.—On the southwest end of Skrifvareklippan a red iron tower 54 feet in height, with two white bands, exhibits, at an elevation of 70 feet above sea level, an alternating flashing white and red light, visible 14 miles.

From a tower 24 feet in height on the extremity of the west pier a group flashing light with white, red, and green sectors is exhibited

at an elevation of 23 feet above sea level. (For sectors and visibility, see Light List and Chart.)

Dangers.—Kalkgrund, a shoal awash, about half a mile south of the west point of Getterö, has a 2¾-fathoms patch close westward of it.

Busen, awash and generally breaking, lies 900 yards westward of Skrifvareklippan.

Ryggen, two shoals, the eastern with 2¼ and the western with 3 fathoms water over them, lie nearly 0.7 mile 212° of Skrifvareklippan.

Masten, with a depth of 2 fathoms over it, is the extreme of shoal water extending 400 yards southward of Skrifvareklippan.

Skälklippan is a rock on the eastern side of the approach, and 1,200 yards southeast of Skrifvareklippan. Shoals with depths of 2 and 1½ fathoms lie, respectively, 250 yards southwest and 700 yards southward of Skälklippan.

Beacon and buoys.—The 2¾-fathom shoal westward of Kalkgrund is marked, on its western side, by a spar buoy surmounted by three down-turned brooms.

The eastern shoal of Ryggen is marked on its eastern side by a red spar buoy, surmounted by an upturned broom over a ball.

Masten is marked on its southeast side by a red spar buoy, surmounted by an upturned broom under a ball.

A spar, with an upturned broom, is moored on the eastern edge of the shoal water east of Skrifvareklippan.

Skälklippan is marked by a spar beacon surmounted by a triangle.

The western side of the channel to the harbor is marked by spar buoys surmounted by upturned brooms; a plain spar buoy marks the eastern side, and a conical red buoy is moored northward of the west pierhead.

Depths.—The depths in the entrance channel are from 4¼ to 9 fathoms, in the roads from 3¼ to 3¾ fathoms, and 13 feet in the harbor at low water.

Outer anchorage.—The outer anchorage, known as Varberg Redden, is between the castle and Skrifvareklippan, in depths of from 3¼ to 3¾ fathoms, over sand, but it is fully exposed to the southwest, and gales from that quarter send in a sea.

Directions.—Trönningeberget, 2½ miles north-northeastward of Varberg, is 233 feet high, and very steep on its southeast side, and Varberg Castle, westward of the town, painted yellow, is a good mark, as it may be seen from 12 to 16 miles; a high water tower stands northeastward of the castle. Apelviksås, a hill about ½ mile southward of the town, also forms a mark.

The following white churches may be seen inland between northeast and southeast of Varberg: Torpa, Hvalinge, Träslöf, Spannarp, Hunnestad, and Tvååker.

Western entrance.—The mark for approaching from the westward is Varberg Church open southward of the castle, bearing 74°, which leads between Busen and Masten, on the north side, and Ryggen on the south, and having passed about 100 yards southward of Masten spar buoy, steer to the north-northeastward, either to anchor in the outer anchorage or proceed between the buoys marking the sides of the channel to the harbor.

South entrance.—Trönningeberget, in line with the north side of the castle, bearing 37°, leads southeastward of Ryggen and 400 yards westward of Skålklippan, and when abreast the latter steer to the northward and proceed as before mentioned.

By night.—The white sector of the west pier light, between the bearings of 20° and 40°, leads between Ryggen and Skålklippan, the northern limit of this sector, passing close southward of the anchorage in the Outer Roads.

Storm signals are shown at Varberg. (See Chapter I.)

Town.—Varberg, a town with 7,043 inhabitants in 1909, is a favorite bathing resort; the quarries in the vicinity yield excellent granite for monuments and pavements.

Harbor regulations.—Special harbor regulations are in force, a printed copy of which should be obtained from the port authorities.

Communication.—There is railway communication with Göteborg, Halmstad, and Malmö; also telegraphic and telephonic communication.

Repairs.—There is a workshop where small repairs can be effected. A crane will lift 6 tons.

Trade.—The chief exports are granite and wood, and imports coal and coke, cotton, feeding stuffs, and grain.

Coast.—From Varberg the coast trends to the southward for 2½ miles to Rödskär, and then in a south-southeast direction for 9 miles to Morups Tånge; about 6 miles east-southeast of Varberg is Nackhällebergen, a hill 463 feet high. Rödskär is a rock of reddish color and Svartskär, about a quarter of a mile southward of it, shows black.

Galtabäckskär lies off a small bay, 3 miles southward of Rödskär, in which is Galtabäck village, and from this to Morups Tånge the coast is fronted by shoal water and rocks, extending from a quarter to half a mile.

Beacon.—A stone beacon, painted white with a red band, stands on Rödskär.

Life-saving station.—A lifeboat and a rocket apparatus are kept as Galtabäck.

Bergs Ref, about 3½ miles south-southeast of Rödskär, and 1½ miles offshore, has a least depth of 4 feet over it.

The highest part of Getterö, open westward of Rödskär, bearing about north, leads westward of Bergs Ref.

Buoy.—Bergs Ref is marked on its western side by a spar buoy, painted red, and surmounted by two down-turned brooms.

By night.—The eastern limit of white light from Morups Tånge, bearing 150°, leads westward of Bergs Ref.

Glommen, a small harbor with depths of from 4 to 5 feet, is situated half a mile northward of Morups Tånge; it has about 200 feet of quay space, with similar depths alongside.

Communication.—There is a post office at Morup, 3½ miles, and a telegraph and telephone office at Långås, about 4 miles distant.

Morups Tånge.—The coast about Morups Tånge is low, and will not be seen from a greater distance than 6 miles, but the white beach is conspicuous, and there is also a church with a steeple painted red, and a windmill near it. As this part of the coast has not been closely examined, it should not be approached within a distance of 2 miles.

Light.—On Morups Tånge a cylindrical stone tower, 91 feet in height and painted white, with a black band, exhibits, at an elevation of 96 feet above sea level, a fixed light, having white, red, and green sectors, which should be visible in clear weather from a distance of 16 miles.

Storm signals are shown at Morups Tånge. (See Chapter I.)

Current.—(See Chapter I.)

Skorren, a shoal with a depth of 1½ fathoms over it lies ¾ mile westward of Morups Tånge.

Buoy.—A spar buoy, surmounted by a down-turned broom, is moored on the southwest side of Skorren.

In clear weather the mark given for Bergs Ref also leads westward of Skorren.

Coast.—From Morups Tånge the coast trends in a south-southeast direction for 20 miles to Tylö; Stafsinge Church, about a mile northward of Falkenberg, has a sharp-pointed spire which may be seen over the surrounding country. Tröingeberget, about 1½ miles northeastward of Falkenberg, is 190 feet high, and Smörstacken, a steep hill near the coast, 4 miles south-southeast of Falkenberg, with a pile of stones on its summit, are both good landmarks.

Falkenberg, Skrea, Eftra, Harplinge, and Vapnö churches may all be recognized from seaward.

Stutarne, a rock near the extreme of a reef with rocks above water and awash, is situated about 2½ miles southeastward of Morups Tånge.

Light—Beacon.—A white stone beacon with a black band marks Stutarne, and from it a fixed red fishing light is exhibited at an

elevation of 15 feet above sea level; it is unwatched and only shown from August 15 to May 15.

Life-saving station.—A lifeboat and a rocket apparatus are kept on the coast about 2 miles southwestward of Stafsinge and within Stutarne.

Falkenberg, about 4¼ miles southeastward of Morups Tånge, is a harbor formed by two piers, which extend in a west-southwest direction from the entrance to Ätran River; the whole of the coast in the vicinity of the piers is fronted by shoal water, extending for a distance of nearly 1 mile from the shore, to the 3-fathom contour line.

Lights.—On the coast, about 600 yards southeastward of the harbor piers, an octagonal red tower, 26 feet in height, with sloping sides, exhibits, at an elevation of 32 feet above sea level, an unwatched flashing light, with white, red, and green sectors; the white light is visible 11 miles, the red 7 miles, and the green 6 miles. (For sectors, see Light List.)

Two fixed red lights are shown, at elevations of 17 and 28 feet above sea level, from posts situated westward of the harbor, and are visible 4 miles. A white quadrilateral day mark has been placed on each post carrying the leading lights in order to render them more conspicuous by day.

Two fixed green lights are exhibited, at elevations of 13 and 25 feet above sea level, from posts on the north pier and at the pilots' shelter, and are visible 2 miles.

These four leading lights for small vessels are not shown when the harbor is closed by ice.

Beacon.—On the southern bank of the river is Lastans red beacon, 75 feet high, conical shaped, and surmounted by a pole and board, shaped in the form of a barrel, lying horizontally.

Dangers.—Skottarefvet, the outermost shoal, has a depth of 1 fathom over it, and is situated 1½ miles 239° from the pierheads.

Buoy.—A red spar buoy, surmounted by a down-turned broom over a ball, is moored on the southwest side of Skottarefvet.

Clearing marks.—Marsten Beacon, in line with the southwest fall of Skallabergets, bearing 131° leads southwestward, and Falkenberg Church in line with the northwest fall of Tröingeberget, 40°, leads southeastward of Skottarefvet.

Mellanrefvet, with rocks awash and partly above water, is a reef nearly 1 mile in length, in a north and south direction, which lies near the edge of the shoal water, and across the entrance to the harbor, from which it is distant about 800 yards.

Buoys.—The eastern side of Mellanrefvet is marked by a spar buoy, and the south side by a black spar buoy surmounted by a ball.

Rosengårdsgrund, eastward of Mellanrefvet and southward of the pierheads, is awash.

Buoys.—The western side of Rosengårdsgrund is marked by four spar buoys, with brooms.

Lybeckarefvet, a shoal with less than 1 fathom water over it, lies on the southern edge of a tongue of shoal and 1½ miles southward of the pierheads. Knola Grund, on which the depth is 2 fathoms, is a detached shoal lying 1¼ miles southwesterly of Lybeckarefvet.

Buoys.—A red spar buoy, surmounted by a down-turned broom under a ball, is moored off the edge of the shoal water, northwestward of Lybeckarefvet.

Two spar buoys are moored in 1½ fathoms water on the western side of the entrance channel, and northward of the preceding.

A spar buoy, surmounted by two down-turned brooms, is moored on the west side of Knola Grund.

Anchorage.—The anchorage for vessels of 12-foot draft (Falkenberg Redden), between Mellanrefvet and Rosengårdsgrund, receives shelter from a westerly sea from the former reef, but winds between southwest and south-southeast send in some swell.

Harbor.—The piers which form the harbor entrance extend for a distance of 714 yards from the northern side of the entrance to the Ätran River, and 1,349 yards from the southern side, respectively.

Depths.—The depth in the harbor is about 13 feet and about the same in the entrance. It is liable to change.

Pilots may be obtained here or at Varberg.

Directions.—Falkenberg old, or southeastern, church in line with the northwest fall of Tröingeberget, bearing 40°, leads southeastward of Skottarefvet, and having passed that reef, steer eastward to bring the same church in line with Lastans Beacon 16°, which course will lead ½ mile westward of Knola Grund and westward of the red spar buoy, northward of Lybeckarefvet, and eastward of the two black buoys surmounted by balls; thence steer about 328° between the buoys marking Mellanrefvet, on the west, and those marking Rosengårdsgrund, on the east, anchoring with Falkenberg old church in line with a notch in Tröingeberget. A stranger should take a pilot.

By night.—The eastern limit of the fixed white light from Morups Tånge, bearing 324°, leads southwestward of Skottarefvet, and the red lights, northwestward of the harbor in line 346°, lead to the anchorage, while the green lights in line 48° lead to the pierheads.

Town.—Falkenberg is a small town with the remains of a mediæval fortress, and a population of 3,880; the salmon fishery of the Ätran is of considerable value.

Communication.—A railway runs to the northward to Göteborg, distant 67 miles, and to the southward to Halmstad, Engelholm, and Malmö; there are post, telegraph, and telephone offices.

Repairs.—Some small repairs might be effected at a workshop.

Storm warnings are posted at Falkenberg. (See Chapter I.)

Marsten, a remarkable rock, is situated southwestward of Smörstacken, 3¾ miles southward of Falkenberg Pierheads, and 1.2 miles offshore; Marstensref and Grimsholmsref, with less than 1 fathom water over them, lie between Marsten and the coast, and there is no passage for a vessel inside that rock.

Beacon.—Marsten is marked by a white stone beacon.

Stensjö Hamn, about 4 miles southeastward of Marsten, is an anchorage for small vessels and a loading place for a brick factory at the town of the same name; there is a depth of 5 feet at the anchorage, over sand and stones, at low water, but some sea comes in with on-shore winds. Vessels generally enter northward of Fogelholm.

Communication.—Stensjö is a post and telegraph station, and there is a telephone to Getinge, about 4 miles distant.

Busörerefven and Skallerefvet, with rocks awash and above water, extend about 1 mile from the land south-southwestward of Skallaberget, and are 6½ miles south-southeast of Marsten.

Buoy.—Busörerefven is marked on its western side by a red spar buoy, surmounted by three down-turned brooms.

Life-saving station.—A lifeboat and a rocket apparatus is kept at Särdal on the coast, about 1 mile northward of Busörerefven.

Tylö, about 12½ miles south-southeast of Marsten, is an islet almost circular in shape, and a quarter of a mile in diameter, and lies about 600 yards northwestward of Tjufhålsudden.

Light.—On the western side of Tylö, an iron 10-sided white tower, 44 feet in height, exhibits at an elevation of 56 feet above sea level a flashing white light, visible 13 miles.

Fog signal.—During thick or foggy weather a siren, worked by compressed air, gives one blast of three seconds' duration every minute.

Tylögrund, on which the depth is 5 feet, lies three-quarters of a mile south-southwest of Tylö Lighthouse.

Buoy.—The southwest side of Tylögrund is marked by a red spar buoy, surmounted by two upturned brooms.

A shoal with 8 feet of water over it lies about 350 yards west-northwestward of Tylögrund. It is marked by a red spar buoy with black broom top mark.

Clearing marks.—Snöstrop Church open southward of Långnäs udde, bearing 68°, or if it should be so misty that the church can not be distinguished, Tjufhålsudden kept northward of a hillock to the

northward of Långnäs udde, on about the same bearing, leads southward of Tylögrund.

Laholms Bukten, 10½ miles wide at its entrance between Tjufhålsudden and Höghallaudde, recedes for a distance of 7 miles from a line joining these points, and has general depths of from 8 to 10 fathoms, decreasing to 6 fathoms at 1½ miles from the beach, over a bottom of sand, covering clay, and with stones in places.

Aspect.—Surrounding Laholms Bukten are several churches, visible from seaward, the most conspicuous being Söndrum, 2 miles westward of Halmstad, with a sharp spire, and standing on high ground, and Snöstorp, about the same distance eastward of Halmstad, with also a sharp spire; the turret of Halmstad Castle and the church, the steeple of which rises from the center of the building, are also marks.

Other churches are Trönninge, with a low, blunt tower, and situated on low ground; Eldsberga on high ground and with a sharp spire; and Skummeslöf, Östra Karup, and Båstad Churches.

Anchorage may be obtained in the bay in depths of from 7½ to 10 fathoms, at 3 miles from the beach, and here a vessel with good ground tackle may ride out a gale, as the sea is somewhat broken by a wide belt of slightly shallower rocky ground, which crosses the bay from Påarpsref to Höghallaudde.

Halmstad Hamn, situated in Halmstads Bukten, in the northern part of Laholms Bukten, is formed by two piers 164 feet apart, extending in a south-southwest direction from each side of the mouth of the Nissa Ån and by the river inside. The western pier is 688 yards in length, and from the end of the eastern pier, which is somewhat longer than the western, an arm 360 yards long extends to the east-southeast and turns to the southwestward and westward for about 1,000 yards, forming the outer harbor, which is about 200 yards in breadth.

Lights.—On the west end of the eastern breakwater a cylindrical white iron tower, 30 feet in height, exhibits at an elevation of 36 feet above sea level a group flashing light, with white, red, and green sectors; the white is visible 11 miles, the red 7 miles, and the green 6 miles. (For sectors, see Light List.)

A white and red fixed light is exhibited at an elevation of 20 feet above sea level from a cylindrical white iron tower on the end of the west pierhead; it shows white over the port.

Two fixed green lights are shown from posts 15 and 24 feet high, respectively, on the west side of the river, within the west pier; the lights at Halmstad are unwatched.

Depths.—The depths in the outer part of the harbor, inside the breakwater, are from 1½ to 2½ fathoms, and in the inner part near the town about 2¼ fathoms.

Dangers.—**Påarpsref,** on which the least depth is 1 fathom, with a detached shoal of 2 fathoms off its northwest end, extends for 1¼ miles in a west-northwest and opposite direction with a breadth of about 400 yards on the eastern side of the approach to Halmstad, its western end being 2 miles from the eastern shore.

A shoal, with a depth of 1½ fathoms over it, lies half a mile southeastward of the breakwater lighthouse.

Buoy.—The western side of the 2-fathom detached portion of Påarpsref is marked by a red spar buoy surmounted by a downturned broom over a ball.

Clearing mark.—The tower of Halmstad Castle opens westward of the light tower on the western pierhead, bearing about 17°, or a lookout tower on Galgberget open westward of the outer breakwater lighthouse, about 1°, leads westward of Påarpsref.

Pilots.—Halmstad is a pilot station, and pilots are always on the lookout from the harbor, boarding vessels between Långnäs Udde and Påarpsref; vessels leaving the port can obtain a pilot on application. Covered pilot boats are kept at the station.

Tugs.—Two tugs are available.

Outer anchorage.—The outer anchorage is southward and southwestward of the breakwater light tower in depths of from 4¼ to 5¾ fathoms, with good holding ground of sand over clay, but open to winds between west-southwest and south.

Directions.—Approach Halmstads Bukten with Halmstad Church bearing about 36°, observing that Snöstorp Church in line with the western lighthouse on the breakwater end, bearing 65°, leads southward of the shoal water near Långnäs Udde, and when Halmstad Church in line with the light tower on the breakwater head bears 21° it will lead to the outer entrance; having rounded a breakwater at a distance of about 100 yards, steer to pass between the pier ends into the river.

By night.—The sector of white light from the breakwater lighthouse, bearing 21°, leads to the outer entrance, and having rounded the breakwater light, steer to the eastward till the two green lights are in line, which leads between the pierheads.

Town.—The town of Halmstad, which is the capital of Halland District, is situated on the west side of the river, about a mile within the pierheads, and has an old castle, the residence of the Landshöfding, a church of the fifteenth century, and a small museum; the railway crosses the river on an iron bridge immediately above the town. The population was 18,332 in 1910.

Harbor regulations.—Special harbor regulations are in force, a printed copy of which should be obtained from the port authorities.

Communication.—There is communication by steam vessels with Lübeck, Hamburg, and Newcastle, and with local ports.

Halmstad has railway communication with Varberg and Göteborg, to the north, and with Helsingborg and Malmö to the south; there are also several other lines, but it is only a station for slow trains. It has telegraphic and telephonic communication.

Coal and supplies.—About 5,000 tons of coal are kept in stock and about 25,000 tons imported annually; the coal wharf has practically unlimited accommodation, with a depth of 15½ feet alongside, and 300 tons of coal could be put on board in 24 hours; four lighters hold 100 tons and three hold 50 tons each.

Supplies of fresh meat, vegetables, and bread can be obtained, and water is good.

Repairs.—Some small repairs might be executed, and there are cranes which will lift 10 and 4 tons.

Life-saving station.—A lifeboat and life-saving station, with rocket apparatus, is maintained.

Storm warnings are posted up at Halmstad. (See Chapter I.)

Trade.—There are wool, cloth, and hat factories, and steam and turbine engines are made, also dairy machinery. The principal exports are rafters, granite, and wood pulp, and imports coal, coke, grain, and pig iron.

Laholm town is situated about 5 miles from the entrance to Laga Ån, which admits boats drawing about 3 feet.

Anchorage.—Laholms Redd, off the entrance to Laga Ån, affords anchorage in depths of from 2¾ to 7 fathoms, according to the distance from the shore; the holding ground of sand and clay is good, but it is open to winds between northwest and southwest.

Communication.—There are post, telegraph, and telephone offices at Laholm.

Supplies of provisions and water may be procured.

Bådstad Anchorage.—Off Bådstad, on the southern side of the bay, vessels may anchor in 5 to 6 fathoms, sand and clay bottom, with the church bearing 216°, about 1 mile off the shore, but it is open to winds between west-northwest and north.

Communication.—There are post, telegraph, and telephone offices at Bådstad.

Supplies of provisions and water may be procured.

Aspect.—Höghalla Udde is the southern entrance point of Laholmsbukten, and the northern point of the peninsula separating it from Skelder Viken, and from it Halands Ås, a hilly ridge, rises abruptly and may be seen from a distance of 20 or 25 miles. Knösen, about half a mile southeastward of Höghalla Udde, is 502 feet high, and is the western termination of the ridge; Häfskull, another range of mountains on the southwest side of Skelderviken, terminates in the Kullen.

As these, the only highlands on this part of the coast, extend in the same direction, and are only 10 or 11 miles apart, mistakes may sometimes occur, by one of these ridges being taken for the other, with the result that a vessel might enter Skelderviken, northward of the Kullen, instead of the Sound. From this resemblance, Hallands Ås has been sometimes termed Falska (False) Kullen.

To prevent any such mistake, it should be enough to observe that Hallands Ås consists of hills of some length, gradually sloping on both sides, whereas that of the Kullen consists of more numerous and shorter hummocks, with steep sides. Again, in approaching Hallands Ås, the churches of Houf and Västra Karup may be easily distinguished, while the Kullen is a remarkable point with a cliff above it 200 feet high, and the lighthouse, standing on an elevation of 240 feet, should form an additional mark for it.

Källran.—The beach between Höghallaudde and Torekov village is fronted by rocks, the adjacent ground being generally foul, and 3 miles west-southwest of the former is Källran, a reef extending nearly half a mile from the coast, with some rocks on it. A shoal with 2¼ fathoms water lies 1,600 yards northeastward of the northwest extreme of Källran.

About 1¼ miles south-southwest of Källran another reef extends about 800 yards offshore.

Buoys.—The northwest side of Källran is marked by a large red spar buoy, surmounted by a down-turned broom. The reef south-southwest of Källran is marked on its northwest side by a red spar buoy, surmounted by a down-turned broom under a ball.

Clearing mark.—Vingaskär and Kullen Lighthouses in line, bearing 212°, lead northwestward of both dangers.

Torekov is a small harbor formed by a breakwater, 162 yards in length, extending in a north-northeast direction from Hamnskär, which affords some protection to small craft during westerly winds. The depth in the harbor is about 4 feet at low water.

The church, situated on the low beach, may be recognized by its high, sharp, and narrow spire, but it is hidden by Hallands Väderö between southeast and east-southeast.

Lights.—A fixed green lantern light is exhibited from Hamnskär; it is a fishing light, and is exhibited throughout the year.

Two fixed red leading lights are established southward of the harbor, which when in line lead through the dredged channel to the quay. They are shown from posts 23 feet and 16 feet high, respectively.

A yacht lies sunk in 23 feet of water about 327 yards north-northwestward from Hamnskär Light. A fixed white lantern marks the wreck and a wreck buoy with green flag is moored south-southwestward of it.

Beacon.—A beacon consisting of an iron staff, 9 feet in height, surmounted by a white oval, marks a rock in the harbor.

Life-saving station.—Torekov is a life-saving station with a rocket apparatus, and a lifeboat is maintained.

Storm signals are shown. (See Chapter I.)

Communication.—There is a post and telegraph office. The nearest railway station is at Grefvie, nearly 8 miles distant.

Supplies of provisions and water can be procured at Torekov.

Pilots.—Torekov is a pilot station, and pilots meet vessels outside Hallands Väderö in covered boats; by night they may be obtained by firing a gun or using a foghorn.

Hallands Väderö, an island about 1½ miles in length, in a north-northwest and opposite direction and 1 mile in greatest breadth, lies 1½ miles west-northwest of Torevok. Being low and wooded, it is difficult to distinguish when seen under the land in the vicinity, but shows out when clear of it.

Light.—On the western side of the island a cylindrical white iron tower 42 feet in height exhibits, at an elevation of 67 feet above sea level, an alternating, fixed, and group flashing white and red light, visible 14 miles. (For period, see Light List.)

Fog signal.—The fog signal is an explosive signal sounding one report every five minutes.

Dangers.—A reef and rocks above water and awash, extend for half a mile northward of the island, and off the west and southwest sides are Svartskär and Orteskären, surrounded by shoal water.

Shoals.—The following shoals exist southward of Hallands Väderö: A shoal with depth of 24.6 feet in (approximately) latitude 56° 25′ 13″ north, longitude 12° 33′ 28″ east; a shoal with depth of 14.7 feet in (approximately) latitude 56° 25′ 30″ north, longitude 12° 33′ 45″ east; a shoal with depth of 16.4 feet in (approximately) latitude 56° 25′ 35″ north, longitude 12° 32′ 37″ east.

Vingaskär, a small rock occuping a space of about ¼ mile, lies ⅜ mile southeastward of Hallands Väderö; being low in the middle, it appears as two rocks and is steep-to on its east side.

Light.—On the southeast side of Vingaskär a lantern at a height of 10 feet, on the corner of a white dwelling, exhibits, at an elevation of 31 feet above sea level, a flashing light with white, red, and green sectors; the white light is visible 10 miles, the red light 7 miles, and the green light 6 miles. (For sectors, see Light List.)

Vrenen is a small rock, 20 feet high, on the extremity of a shoal which extends about 700 yards eastward of the east point of Hallands Väderö; its eastern side is steep-to.

The southeast side of Hallands Väderö, from Vrenen to a rock eastward of the south point of the island, is fringed by rocks and shoal water to a distance of about a quarter of a mile, and between

this and Vingaskär are several dangers, also westward of that rock. Kollingebåden is a shoal awash, nearly 400 yards 14° of the north point of Vingaskär.

Beacon.—A pole beacon, 25 feet high and painted red, with an arm, painted white, pointing to the eastward, stands on Vrenen.

Buoy.—Kollingebåden is marked on its north side by a black spar buoy, surmounted by a ball.

Anchorage may be obtained eastward of a line joining Vrenen and Vingaskär, in depths of from 6½ to 8 fathoms, and with some protection from winds between northwest and southwest, but the swell is sometimes felt, and it is open to the northward. The best berth is with Kullen high lighthouse in line with a little hillock in the depression of Vingaskär, bearing 211° and Torekov Church 115°.

There is less swell with southwest winds off the northeast side of Hallands Väderö, but the holding ground is not so good, and toward Torekov the anchorage is exposed to the northwestward and the bottom is foul.

Directions.—The anchorage may be approached from either side of Hallands Väderö, and if from the northward, Höghallaudde, should not be brought to bear to the northward of 92° until Vingaskär Beacon and Vrenen are in line, bearing 176°, when pass about 200 yards eastward of the beacon on the latter rock, to the anchorage.

From the southward Torekov Church should be kept well open north of Houf Church, bearing 79°, until Vrenen Beacon opens eastward of Vingaskär, 335°, when steer to the northward, passing about 200 yards eastward of Vingaskär, to the anchorage.

By night.—From the northward approach in the white sector of Vingaskär Light, with Kullen High Light open west of it, bearing 211°, and anchoring with Torekov green light bearing 115°. The white sector of Vingaskär Light to the southward also leads clear approaching from that direction, and passing 400 yards eastward of Vingaskär, steer 8° to the anchorage.

Skelder Viken, between Skaudde, 2 miles southward of Torekov and Kullen, is 8 miles in width, and recedes for nearly 12 miles, with depths of from 8 to 14 fathoms, shoaling to 5 fathoms at its head, at 1 mile from the shore, the bottom being composed of sand and clay, but of stones toward the north and south shores.

Aspect.—The northeastern side of the bay, round the head as far as Svanhals Udde, on the south side, is low, but from the latter the hilly ridge of the Kullen commences, and rises to a height of 616 feet. Around the coast are Grefvie, Förslöf, Barkåkra, Farhult, and Jonstorp Churches, all fairly conspicuous from seaward, but only a small portion of the white masonry tower of Engelholm Church is seen above the trees.

Dangers.—A shoal, with a depth of 2¾ fathoms over it, lies about 1,400 yards northwestward of Skaudde, and 600 yards offshore.

Buoy.—The above shoal is marked on its western side by a red spar buoy, surmounted by two down-turned brooms.

Grytskären are rocks lying on the extreme of a reef extending 1,200 yards from the shore, at about 4½ miles southeastward of Skaudde.

Grytgrund, a shoal with 4 feet water over it, lies 1,600 yards 283° of Grytskären; 800 yards northwestward is a shoal of 2 feet; 1,600 yards westward and 400 yards southward of Grytgrund are shoals of 3¾ fathoms, and one of 3¼ fathoms lies about 800 yards from it in a northeast direction.

Bergströmsgrund, about 1.1 miles south-southwestward of Grytgrund, has a depth of 2½ fathoms over it. A shoal with a depth of 3 fathoms lies about 1,200 yards northwest of Bergströmsgrund.

Buoy.—A red spar buoy, surmounted by a sphere with broom points down above it, is moored westward of the 3-fathom shoal northwest of Bergströmsgrund.

Clearing mark.—The whole of Hallands Väderö, open of Skaudde, bearing 333°, leads westward of the above shoals and foul ground.

Coast.—From about 3 miles south-southeast of Grytskären, round the head of the bay to Svanhals Udde, the coast is fringed by shoal water, which gradually increases its distance, of about half a mile offshore at the entrance to Rönne Ån, to 1¼ miles off Kustens and at Halsa Redd.

Buoy.—A black spar buoy, surmounted by a ball, is moored on the shoal water at Halso Redd, and about 1,200 offshore northeastward of Jonstorp Church.

Anchorages.—If necessary to anchor in the bay the best berth will be found between Veibuyudde and Jonstorp Church, with the latter bearing 211°, the depth being about 6½ fathoms, with good holding ground, and a vessel with good ground tackle might even ride out a northwest gale at this anchorage.

Small craft, of less than 10 feet draft, can anchor at Halsa Redd, with Jonstorp Church bearing about 261° and Farhult Church 171°.

Engelholm Hamn, about 2½ miles by the river from the town of Engelholm, is formed by two piers, 1,558 and 1,263 feet, respectively, in length, 148 feet apart, and will accommodate about a dozen small craft, of less than 6½ feet draft, but there is only 3 feet between the hamn and the town. There is a rocket apparatus; but no lifeboat.

Light.—A white and red alternating light is exhibited at an elevation of 13 feet above sea level, from the gable of a dwelling 16

feet in height, situated on the north pierhead; the white light is visible 6 miles and the red light 4 miles.

Depths.—There is a depth of 6 feet between the piers at low water and from 12 to 16 feet in the hamn.

Outer anchorage.—The anchorage outside is about 1 mile west-northwest of the piers, in depths of from 3¾ to 5 fathoms, over a good holding ground of stiff blue clay, covered with a thin layer of sand, with the light dwelling bearing 75°, and Barkåkra Church in line with a house on the beach 48°.

Town.—The town of Engelholm, with about 3,600 inhabitants, is on the northern bank of the Rönne Ån, which is crossed by a railway bridge; there is a trade in corn, and the fishery is of some value.

Communication.—Engelholm is a railway junction for Malmö and for Klippan, and has post and telegraph offices; also a telephone between it and the hamn.

Supplies of provisions may be procured.

Life-saving stations.—There is a lifeboat and a rocket apparatus at the hamn; also a rocket apparatus at Arild, a village about 3 miles west by north of Svanhals Udde.

Kullen, the northeast entrance point to the Sound, and the termination of the promontory which forms the south side of Skelder Viken, is a remarkable point having over it a cliff 200 feet high; the highest parts of the end of the promontory are Östra and Västra Högkullen, which are 616 and 575 feet above sea level, respectively. A depth of 6¼ fathoms lies 5 miles 266° from Kullen Light. It is in the position of the wreck of the steamer *Urania*, sunk in collision in 1913.

Lights.—On the western face of the hill at Kullen is a grey stone tower, 49 feet in height, which exhibits, at an elevation of 289 feet above sea level, a flashing white light; it is visible 24 miles.

On the extreme of the Kullen, forming the entrance point to the Sound, a cylindrical white iron tower exhibits, at an elevation of 38 feet above sea level, an alternating white and red light, visible 10 miles, and the red light from 7 miles.

Fog signal.—From a fog-signal house northwestward of the high lighthouse, and 80 feet above sea level, a compressed-air siren gives 2 blasts every minute.

Ice signals.—From an ice signal station near the flagstaff situated close to the southward of the high lighthouse, ice signals and signals regarding lightvessels are made. (See Chapter I.)

(For the continued description of the coast to the southward of Kullen, see Chapter V.)

CHAPTER III.

EAST COAST OF JUTLAND TO THE LITTLE BELT.

The Skaw or Skagen, the low and sandy northeastern point of Jutland, at the junction of the North Sea with the Kattegat, and the turning point into the latter in proceeding to the Baltic, is passed during each year by a large number of vessels.

Light.—Near the extreme of the Skaw a cylindrical gray tower, 152 feet in height, exhibits, at an elevation of 144 feet above sea level, a flashing white light, visible 18 miles.

Lloyd's signal station.—Lloyd's signal station, situated immediately eastward of the lighthouse, is connected with the general telegraph system, and messages between it and passing vessels can be exchanged from sunrise to sunset, using the International Code, but between the bearings of 177° and 194° it is obscured by a hotel, and signals should be kept flying until past the arc of these bearings.

Storm signals are shown from the wind semaphore at the Skaw. (See Chapter I.)

Submarine telegraph cable—Beacons.—A cable connects the Skaw and Marstrand, and two red and white beacons, near the old lighthouse, and southwestward of the present tower, when in line, point out the direction of the shore end. (See Chapter I.)

Ice signals.—Signals respecting ice in some localities, and also regarding the removal of certain lightvessels on that account, are made from the Skaw lighthouses. (See Chapter I.)

Pilots.—A pilot steamer named the *Skagerrack* is stationed near the Skaw; it has two masts and a yellow funnel, is painted dark green, and has "Dansk Lods" (Danish pilot) marked on its sides. A pilot boat from Frederikshavn also cruises in the neighborhood. These pilot boats provide pilots for Hirsholm, Frederickshaven, the Sound, Nyborg, Korsör, and Fredericia, and pilots undertake unbroken pilotage through the Kattegat and the Sound to Falsterbo and Bornholm. A Swedish pilot boat provides pilots for the Skärgård and coast of Sweden, as well as for Arendal in Norway.

Skaw Spit (Skagens Reef).—Grenen Spit, a narrow neck of land extending eastward from Skaw Lighthouse, consists of compact hard sand, and from its extreme Skaw Spit, which breaks heavily in bad weather, and composed of hard white sand, with here and there stone ballast thrown over by stranded vessels, stretches out in an

east-northeast direction for a distance of 2 miles to the 10-fathoms contour line.

On the southern side of Skaw Spit, the depth increases gradually, so that the soundings are a good guide; but the northern side is steep-to, and should not be approached within a depth of 13 fathoms, from which it shoals suddenly to 4 fathoms. During the day, the edge of the spit may be distinguished from aloft by the discoloration of the water.

Life-saving station.—A life-saving station, equipped with motor lifeboat, is established near Skagen.

Lifeboat.—A lifeboat is stationed at Grenen Spit.

Lightvessel.—Skaw Spit Lightvessel, moored in a depth of 20 fathoms, 3½ miles east-northeast of Skaw Lighthouse, is masted and painted according to the Danish system, see Chapter I, with "Skagens Rev" on its sides; it exhibits, at an elevation of 33 feet above sea level, a flashing red light, visible 11 miles.

Fog signal.—During thick or foggy weather a fog siren gives one blast of five seconds duration every two minutes.

Caution.—On account of the strong current which sometimes prevails, vessels passing the lightvessel should give it a good berth. A vessel passing close to the lightvessel should pass astern of it.

Buoys.—A conical red buoy, surmounted by three upturned broom, is moored near the northeast extreme of the spit, in 13½ fathoms water.

A conical red buoy, with two upturned brooms, in a depth of 4¼ fathoms, marks the southeast side of the spit. These buoys remain in their places until carried away by ice, when others are, as soon as possible, substituted for them.

Anchorage.—With westerly and southwesterly winds temporary shelter will be found southeastward of the Skaw in 8 or 9 fathoms, sandy bottom, with the old lighthouse bearing about 340°.

Currents.—From a summary of several years' observations of the currents on board the lightvessel at the Skaw, the following may be expected with, or after, winds from the quarters metioned:

With westerly winds, an easterly current, with rates of from 1 knot to 4 knots. A north or northeast-going current, probably weak, may be experienced with these winds, and if the wind is from the northwest a southeast set may be found.

With southeast winds, east, northeast, or north-going current; the latter usually strong if the wind is the same.

With northeast winds, a current setting between northeast and north, generally weak, but sometimes attaining a rate of 2 knots.

With long-continued east winds, a northwest-going current, probably weak, may be experienced.

During calms, weaker currents are probable, but are not to be depended on, as an easterly set attaining a velocity of 2½ knots may be found.

Ice.—During easterly gales in winter the ice piles up on that part of the spit where there is less than 1 fathom water, and sometimes remains for a long time after the rest of the ice is gone.

Coast—Aalbek Bight.—From Grenen Spit the east coast of Jutland trends in a southwest direction, for 11 miles, and then curves around to the south-southeastward for a similar distance, forming Aalbek Bight, which recedes 5 miles between these points.

Aspect.—The coast is low and sandy, but has some hills in the background, and low sandhills sometimes covered with heath; there are attempts at cultivation, and a few plantations of broken and blasted pines. A hotel consisting of two large, low, dark buildings, is situated close to the foreshore, nearly ½ mile northeast of Skagen Lighthouse, and old Skagen Beacon standing on a hillock, is seen from the eastward over Skagen town and the sandhills.

Aalbek church is dark colored, with a broad spire; Elling and Aasted churches, both white, have square towers, the former is somewhat larger than the ordinary churches; Lærbek and Knivhold mills; Frydenstrand sanatorium, and a church in Frederikshavn, close to the harbor, with a tall spire rising from a square tower, are all conspicuous, but the church at the north end of Frederiskshavn is not so.

Dangers.—The coast from the Skaw as far as Napstiert, 13 miles southwestward, has two distinct bars off it, nearly parallel to each other, the outer being at the distance of 200 or 300 yards, with depths of from 7 to 12 feet over it. The inner bar, about 80 yards from the beach, has a depth of 6 feet, and between the bars there are depths of 12 to 14 feet.

Although the fury of the sea is somewhat abated by breaking on the outer bar, yet the short distance between the two is not sufficient for an anchorage.

Coast—Dangers.—Aalbek fishing village is situated 9 miles southwestward of Skagen, and in the bight the water shoals gradually toward the shore, but about 2½ miles south-southeast of Aalbek is a shoal with a depth of 2¾ fathoms over it, which lies abreast of Napstiert village and 1.2 miles off the shore.

Krageskov Rev, on which the depth is 2¼ fathoms, lies immediately southward of the preceding shoal.

Anchorage.—With the exception of these dangers Aalbek Bight has a clear sandy bottom, and is a good anchorage in unsettled weather with the prevailing west and southwest winds, the holding ground being good.

Water is easily procured between Aalbek and Napstiert villages.

Life-saving stations.—There is a lifeboat and rocket apparatus at Aalbek village and a lifeboat at Jerup village.

Skagen Harbor, situated about 1¾ miles west-southwest of Skaw Lighthouse, is formed by two breakwaters which extend in a southeast direction for about 550 yards from the coast, their ends curving together, but leaving an entrance between them nearly 200 feet wide.

Within the harbor a pier extends parallel to the coast, from the southwestern breakwater, for a distance of 350 yards, toward a short pier from the opposite breakwater, with an entrance between about 130 feet wide into an inner harbor.

Lights.—On the breakwater ends are cylindrical gray towers, 23 feet in height, and from that on the northeast breakwater head a fixed green light visible 3 miles is exhibited, at an elevation of 29 feet above sea level.

From the tower on the southwest breakwater head an occulting red light is exhibited at an elevation of 19 feet, visible 5 miles.

From posts on the inner pierheads, at elevations of 18 feet above sea level, a fixed green light is exhibited on the northeast and a fixed red on the southwest side, but these two lights are only visible over the harbor.

Fog signal.—During thick or foggy weather a hand foghorn gives one long blast, followed by one short blast, every minute, but it may not be sounded in bad weather.

Depths.—The depth in the outer entrance is 3¼ fathoms, and in the outer portion of the harbor 2¼ fathoms. There is from 1¾ to 2 fathoms water in the inner harbor and the piers have a depth of 1¼ fathoms alongside.

Pilots for Skagen may be obtained from the pilot steamer at the Skaw or at the harbor, where pilots for Hirsholm and Frederikshavn may also be procured.

Signals.—The following signals regarding entry and exit are made:

A black ball by day or a fixed green light hoisted 4 feet above the fixed green light by night denotes that entry into the harbor is prohibited.

Two black balls by day or a fixed white light 4 feet above the fixed green light by night indicate that exit from the inner harbor is prohibited.

Storm signals.—Additional storm signals are made from the health office on the south breakwater at Skagen. (See Chapter I.)

Current.—The current sets generally to the northeastward outside the harbor.

Skagen.—The town of Skagen, founded in the fourteenth century, has low dwellings, built with crossbeams and surrounded by

tarred plank palings, and not laid out in streets, but built in the most sheltered positions under cover of sand dunes to protect them from the drifting sand. It is a favorite sea-bathing place, with a population of 2,936 in 1906, and has hotels.

Communication.—A railway runs to Frederikshavn, a distance of 25 miles, and there are post, telegraph, and telephone offices.

Supplies of provisions and water may be obtained.

Repairs to motor boats are made at a workshop.

Life-saving station.—A lifeboat and rocket apparatus is stationed at Skagen, and a life-saving station, with motor lifeboat, is established near by.

Hertha Flat, situated about 10 miles east-southeast of Skagen Havn, is a shoal 1¾ miles in length, in an east-southeast and opposite direction, with depths of 8 and 9 fathoms and from 11 to 14 fathoms around; ½ mile from its northeast side is a patch with 5 fathoms over it.

Buoys.—The northeast side of the 5-fathom patch is marked by a conical red and white vertically striped buoy, moored in 5½ fathoms water.

The southwest side of the patch is marked by a black spar buoy, moored in 12½ fathoms, 400 yards from the preceding buoy.

Strandby Boat Harbor, 6½ miles south-southeast of Aalbæk, has a depth of 4 feet, which is increased by northerly and reduced by southerly winds.

Communication.—There is railway communication with Frederikshavn, and a post and telegraph office.

Hirsholm.—From abreast of Jerup and immediately southward of Krageskov Reef the 3-fathom contour line draws off the coast, and shallow water extends for about 3¾ miles in an east-northeast direction from the south point of Aalbek Bight, having near the northeast edge and about 3 miles offshore Græsholm and Hirsholm, two low, flat islands without woods, which occupy a space of 1¼ miles in a northwest and opposite direction.

Several islets lie off the west and northwest sides of Græsholm, and are generally connected to it by a dry bank. Hirsholm, the southeast island, is inhabited.

Light.—On the northeast point of Hirsholm a cylindrical tower of granite, 87 feet in height, exhibits, at an elevation of 98 feet above sea level, a white group flashing light.

Between the groups of flashes a fixed white light is shown from 6° to 12°, and a fixed red light from 12° to 17°.

The light has also fixed white and red sectors for clearing the shoal ground off Frederikshavn (see Light List) and is visible 15 miles.

Fog signal.—During thick or foggy weather a steam siren gives

three blasts each of two seconds' duration, in quick succession, every minute.

Dangers.—Northwest Reef extends in a northwest direction about 1,200 yards from the north extreme of Græsholm, and the north edge of the shoal water trends from it toward Strandby boat harbor.

Buoy.—A conical red buoy surmounted by an upturned broom in 3¾ fathoms water, marks Northvest Reef.

Northeast Reef extends about 1,200 yards eastward of the east end of Græsholm, and the eastern side of Hirsholm is foul but may be approached to ½ mile.

Buoy.—A conical red buoy surmounted by two upturned brooms is moored in a depth of 4 fathoms on the east edge of Northeast Reef.

Kirkehavn, on the north side of Hirsholm, is a small natural harbor with a depth of 6 feet, affording shelter to small vessels from southerly winds.

Hirsholm Harbor, on the southwest side of Hirsholm, is formed by two breakwaters, one about 600 feet in a west-northwest direction, and the other extending south for a distance of 400 feet, the entrance being about 100 feet in width.

There is a depth of 12 feet in the entrance and 10 feet inside, but westerly winds raise the water, and those from southeast lower the level 3 feet.

Light.—On the extreme of the south breakwater a grey iron post, 10 feet in height, exhibits, at an elevation of 13 feet above sea level, a fixed white and green light, visible 2 miles.

Pilots may be obtained for the east coast of Jutland, for the Sound, Nyborg, Korsör, etc., and undertake unbroken pilotage through the Great Belt to Albuen, Gulstav, Gjedser, and Bornholm. Also along the west coast of Jutland from the Skaw to Horn Reefs and Graa Deep Bar.

Communication.—There is telephonic communication with Frederikshavn.

Submarine telegraph cable.—A cable connects Hirsholm Havn and Frederikshavn.

Supplies.—Some provisions and water may be obtained.

Dangers westward of Hirsholm.—Shoal water, with a depth of 1¾ fathoms, extends for about ½ mile southward of Hirsholm, and from this the edge of the bank on which the islands stand trends in a southwest by west direction for about 2 miles.

Kjölpen, on the edge of the bank, 1,700 yards from Staalhage, the south point of Hirsholm, is an islet surrounded by a bank about ½ mile long.

Westward of Kjölpen are Mölle Reef, with 9 feet, and Holmhavn Reef, with 5 feet over them, and farther westward are Syvestenen

and Peter Poulsens Reef, with 7 and 5 feet, respectively, all on the same bank.

Buoys.—A red spar buoy surmounted by an upturned broom is moored in 15 feet on the east side of Holmhavn Reef.

The west side of Peter Poulsens Reef is marked by a white spar buoy, surmounted by a straw wisp, in a depth of 13 feet.

A red and white striped spar buoy, surmounted by a broom over a straw wisp, is moored in 13 feet on the north side of Syvestenen.

Holmhavn, a temporary anchorage for small vessels, is about ⅓ mile westward of Kjölpen and agords some shelter from northeast winds, but strangers should only approach it from the southward, although those locally acquainted cross the bank between Græsholm and Hirsholm on the east and the mainland on the west.

Frederikshavn Nordre Roadstead.—From Peter Poulsens Reef the edge of the bank turns to the southward and surrounds Deget, a small island, with a fort on its eastern side, and in the bight to the northward of Deget is Frederikshavn Nordre Roadstead which affords temporary anchorage, with good holding ground, but easterly winds raise a sea.

Söndre Roadstead is the channel eastward of Frederikshavn.

Clearing mark.—The edge of the bank and dangers on the west side of the Nordre Roadstead may be cleared by keeping Sæby church in line with the east end of Deget, bearing 197°, which leads eastward of them.

Approach to Frederikshavn.—Deget, lying near the edge of the bank, about 1½ miles eastward of Frederikshavn, has rocks on its south and west sides, and 600 yards from the latter is Hjellen, a small rock, between which and the mainland the depths are less than 6 feet; the bank extends about ¾ mile southward of Deget, and turns to the westward, forming the northern side of the approach to Frederikshavn.

A buoyed channel exists across the bank between Döde Anders, a rock with a depth of 5 feet over it, off the west end of Deget, and Hjellen. Sæby church just open westward of Hjellen, bearing about 190°, leads through it in a depth of 10 feet.

Dangers.—Trestens Reef, with a depth of 6 feet over it, lies near the south extreme of the bank, half a mile southward of Deget, and between it and that island are Sæl, Spejder, and other reefs.

Marens Reef, with 2 fathoms water over it, lies 800 yards southeastward of Trestens Reef and nearly 1,600 yards south-southeast of the east end of Deget.

Buoy.—A conical red buoy surmounted by three upturned brooms is moored in a depth of 5½ fathoms 500 yards eastward of Marens Reef.

Borrebjerg Reef, with 1¾ fathoms water over it, is the northern portion of a shoal which lies 1.2 miles southward of Deget; Laurs Reef, the southern part, about 400 yards from Borrebjerg Reef, has a depth of 2¼ fathoms.

A shoal, with 3¾ fathoms over it, lies a ¼ mile southeast of Laurs Reef and 1 mile from the entrance a little northward of the line of the leading lights.

Buoys.—A white can buoy surmounted by three downturned brooms is moored in 4 fathoms 100 yards northward of Borebjerg Reef.

The south side of Laurs Reef is marked by a conical red buoy surmounted by an upturned broom; it is moored in a depth of 4 fathoms.

Brune Reef, a portion of which sometimes dries, lies 700 yards northeast of the entrance to the harbor; a shoal with 3¾ fathoms water over it is situated 400 yards south-southeast of Brune Reef.

Buoy.—Close southward of Brune Reef is a conical red buoy surmounted by two upturned brooms; it is in 3½ fathoms water.

These dangers all lie southward of the edge of the bank, which extends from Hirsholm to the land, and between them and the bank are other shoal patches, which will be seen by referring to the chart. On the shore bank, which extends eastward of Frederikshavn, are Busse, Malt, and Simons Reefs, all out of the way of navigation, except in the case of small craft using the channel inside Deget.

Frederikshavn is formed by two outer breakwaters, which extend from the shore in a southeast direction, curving toward each other at the ends, the northeastern being about 500 and the southwestern 440 yards in length, and the entrance between the ends 300 feet in width.

A pier about 1,000 feet in length extends from the middle of the northeast breakwater in a southwest direction toward a short pier projecting from the other breakwater, dividing the port into an outer and inner harbor, with an entrance to the latter about 300 feet in width. The inner harbor is divided into east and west harbors, and the outer harbor has an area of about 40 acres.

The berthing quays, principally built of wood, and 3,400 feet in length, with depths alongside ranging from 12 to 25½ feet, are lighted by electricity and have a railway running on them; dredging is carried on as required and vessels are safe alongside in all weathers.

Lights.—On the northeast breakwater head a tower 21 feet in height, with a square base, and circular gray upper part, exhibits at an elevation of 26 feet above sea level, a fixed light with white and green sectors. The white light is visible 8 miles and the red 4 miles. For sectors, see Light List.

Leading lights.—A red fixed light is exhibited, at an elevation of 26 feet above sea level, from a circular gray tower, 23 feet in height, with a square base, situated on the western pierhead; it is visible 8 miles.

On the pierhead, at the southern side of the entrance to the inner harbor, a black iron stand, 36 feet in height, with a red lantern, exhibits, at an elevation of 38 feet above sea level, a fixed red light, which is visible 8 miles.

The lights are 550 yards apart, and in line bearing 302°. (Remarks, see Light List.)

A fixed red light is shown at the outer end of the southwest pier and a fixed green light on the end of the northeast pier at the entrance to the inner harbor.

Fog signal.—During thick or foggy weather a steam siren gives two blasts every minute. If the siren is out of order a horn will be sounded.

Depths.—The depth in the entrance, in the greater part of the outer harbor, and in the eastern inner harbor, is 3¾ fathoms; in the western inner harbor the general depth is 3 fathoms. Westerly gales raise the level of the water 4 feet, and those between east and southeast lower it about 2¾ feet.

Bellbuoy.—A conical shaped red bellbuoy is moored in a depth of 6 fathoms, 1.6 miles 124° from the entrance and 200 yards 350° from the line of the leading lights; in winter it is replaced by a conical red buoy.

Söndre Roadstead.—The best anchorage in Söndre Roadstead is in depths of from 4 to 4½ fathoms with good holding ground, about a third of a mile 147° from the entrance with Fdererikshavn Castle and mile in line, bearing about 330°, and approaching it southward of the dangers already mentioned; it is sheltered from winds between east, through north, to southwest, but those from other quarters raise a sea.

Small vessels may anchor in what is known as Degelöb, or the north corner of Söndre Roadstead, in a depth of 10 feet, over clear sandy bottom, with the northwest point of Deget bearing about 39°, the south point of Hirsholm being shut in by it.

Pilots for the place or for ports on the east coast of Jutland may be obtained; they can also undertake through pilotage from the Skaw by the Sound or Great Belt to Albuen, Gulstav, Gjedser, and Bornholm. They can also pilot vessels along the west coast of Jutland from the Skaw to Horn Reefs and Gråå Deep Bar.

Tugs.—One tug is available.

Directions.—Approaching from the northward and eastward, Hirsholm Lighthouse, the high land of Bangsbo, and Flade Church,

which is white and on ground 360 feet high, are all landmarks; Frederikshavn Castle and the church near the harbor will also point out the place. Berreknob, a rounded hillock on Bangsbo high land, in line with the southwest breakwater lighthouse, bearing about 268°, leads between Marens and Brune Reefs, on the north and Borrebjerg Reef on the south side, in not less than 3¾ fathoms.

Entering southward of Laurs Reef, the conspicuous church kept between the breakwater heads, 314°, leads southward of that shoal to the harbor, but a sailing vessel should not approach too closely until the harbor is well open, nor should sail be shortened too soon, as for want of headway there might be a risk of the vessel being thrown on the breakwater heads by the sea.

Coming from the southward, Frederikshavn Mill and Castle in line, bearing 330°, lead to the entrance.

By night.—Having passed eastward of Hirsholm from the northward, the sector of fixed white light from Hirsholm, between the bearings of 8° and 14°, leads eastward of the northern dangers off Frederikshavn, and to the bellbuoy, when the leading lights in line 302° lead to the entrance. The fixed green light from Hirsholm Harbor is also a guide when passing southward of Hirsholm.

Submarine telegraph cable.—A telegraph cable, from nearly 1 mile northward of Frederikshavn Church, crosses to Hirsholm, its direction being marked by telegraph beacons. (See Chapter I.)

Tides.—It is high water, full and change, at 5h. 11m.; the ordinary rise is about 1 foot.

Ice.—Average ice conditions, see Appendix.

Town.—Frederikshavn is a rising town with 7,921 inhabitants in 1910, but the houses are only of two stories, and the streets are paved with rough stones.

Communication.—There is communication by steam vessel with Newcastle, Copenhagen, Göteborg, Christiania, and Christianssand; a railway to Skagen and to Aalborg, the latter distant 50 miles, and post and telegraph offices.

Coal and supplies.—From 2,000 to 3,000 tons of coal are kept in stock, and from 12,000 to 15,000 tons are imported annually; vessels are coaled alongside the quays by barrels or baskets, and from 400 to 500 tons could be put on board in 24 hours. The coal wharf is 650 feet in length, with a depth of about 23 feet alongside, and there are also six lighters holding 30 tons, two of which are kept loaded, but vessels coaling in Söndre Red might be delayed by winds between east and south.

Fresh provisions are cheap and plentiful, according to the time of the year. Water is laid on to the quays, or may be obtained from a water boat or a tug; it is good, and can be used in small tube boilers.

Dock.—There is a floating dock with following dimensions: Length over all, 200 feet; depth on sill, 16 feet; lifting power, 1,700 tons. There is a hand crane which will lift 10 tons, and a salvage steamer with a diving apparatus is stationed in the harbor.

Storm signals are shown from a mast at the inner end of the southwest breakwater. (See Chapter I.)

Time signal.—A time signal for rating chronometers is given daily at the telegraph office at 1h. 0m. 0s. mid-European time. (See Chapter I.)

Compass deviation.—In the eastern inner harbor are wooden (Dalben) beacons, and from the southward of these Sæby Church bears 185° and Flade Church 253°.

Trade.—The principal article of export is butter, and the manufactures consist of boat building, fishing requisites, tiles, bricks, sailcloth, tallow, and tarpaulins.

Coast.—From Frederikshavn the coast trends to the southward for about 12½ miles to Stensnæs, and then turns south-southwest for 16 miles to Hals, on the north side of the entrance to Lim Fiord. Banksbo high land, Sæby Church, which has a bell tower, but no steeple, and Flade Church, on high ground, have been mentioned as conspicuous objects.

Between the fishing village of Bangsbo and Stensnæs the land is generally flat, forming level downs, and from Stensnæs it is also flat and wooded in places. There are churches at Karup and Lyngsaa, and mills at Vorsaa, Söraa, and Asaa; westward of Stensnæs are the hills of Degnenshöj and Holdenbjerg.

Hov is a fishing village 5½ miles southward of Asaa, and about 5 miles further south are Hals Church and Egense Point Lighthouse at the entrance to Lim Fiord.

Depths offshore.—For a distance of 9 miles southward of Frederikshavn the 3-fathoms contour line is 1½ miles offshore, and the 4-fathoms contour, which is about 1 mile from Frederikshavn, increases its distance from the coast to 3 miles off Lyngsaa, 12 miles southward, after which it incloses Dvale Grunde and various shoals which lie off the coast between Stensnæs and Hals.

Sæby Harbor consists of two breakwaters which extend in an easterly direction from the shore, the northern, about 750 feet in length, curves to the southward at its end, the southern has an east-southeast direction, for 550 feet, and turns to the northeastward for about 430 feet to its head, the entrance facing east, between it and the north breakwater being about 100 feet.

From the root of the northern breakwater a pier extends into the harbor for 500 feet, and forms the north extension of a rivulet which runs into the harbor and along its southern side.

Lights.—On the northern breakwater head a fixed green lantern light is shown at an elevation of 20 feet above sea level, and on the southern breakwater head a fixed red light is shown at a similar elevation.

A fixed white lantern light is exhibited from the pierhead on the north side of the harbor, at an elevation of 23 feet.

The lights are all shown from grey posts between August 1 and May 1.

Depths.—There is a depth of 12 feet in the entrance, and the same in the harbor, but gales between west and north raise the water and those from the eastward lower it about 3 feet.

Warping Buoy.—A warping buoy lies outside the harbor.

Pilots for the harbor, and for Hirsholm, Frederikshavn, Asaa, and Hals may be obtained.

Anchorage.—Vessels unable, from the draft of water, to enter the harbor may anchor in any convenient depth off the coast abreast, remembering that the 3-fathoms contour line is 1½ miles from it.

Town.—Sæby, a small town with 1,943 inhabitants in 1906, has a chalybeate spring and sea bath.

Communication.—Sæby is a station on the railway between Aalborg and Skagen and has post and telegraph offices.

Coal and supplies.—Some coal and fresh provisions may be obtained and water at the harbor.

Repairs.—Small repairs to machinery can be executed.

Lifeboat.—A lifeboat is stationed at Sæby.

Submarine telegraph cable—Beacons.—From about 2¾ miles southward of Sæby a cable crosses to the west point of Læsö; it is marked by two red and white telegraph beacons. (See Chapter I.)

Dvale Ground, 3¾ miles in length in a north and south direction within the 3-fathoms contour line, lies off the coast abreast of Lyngsaa and Stensnæs, its east extreme being 4¼ miles distant from it; the least depth on the shoal is 1½ fathoms.

This shoal, with others, and the channels between them, is composed of hard sand sometimes covered with seaweed, especially in the latter; the light-gray sand on Dvale Ground shows up well in sunlight, and it then may be seen from a distance of 2 miles.

Lightvessel.—Læsö Rende Lightvessel, masted and painted in accordance with the Danish system (see Chapter I), is moored in a depth of 10 fathoms, eastward of Dvale Ground; it exhibits, at an elevation of 33 feet above sea level, a flashing white light visible 11 miles.

Fogsignal.—A siren gives a blast of four seconds' duration every minute.

Buoys.—A conical red buoy surmounted by an upturned broom is moored in a depth of 6 fathoms 1.8 miles north-northeast of the 1½-fathom shoal of Dvale Ground.

A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 5½ fathoms, ½ a mile eastward of the 1¾-fathom patch on Dvale Ground.

A conical red buoy, surmounted by three upturned brooms, is moored in 4½ fathoms water, 3½ miles south-southwest of Dvale Ground.

Clearing mark.—A conspicuous slope on the south end of Jydske-Aas Ridge in line with Holdenbjerg, bearing 248°, leads northward of Dvale Ground.

Læsö Channel, between Dvale Ground and Læsö, is described in Chapter IV.

Middel Ground consists of shoal heads, with depths of from 2½ to 3 fathoms, the least water being 2¼ fathoms; it stretches from 1 mile westward of the south end of Dvale Ground southward to abreast of Asaa.

Land Deep is the channel, about 1½ miles in width, between Dvale Ground and Middel Ground and the shoal water extending off the mainland; it has depths of from 3¼ to 4½ fathoms, but there are patches of 3 fathoms nearly in midchannel at its north and south ends.

This channel has less current in it than Læsö Channel, and is somewhat sheltered by the adjacent shoals, with good holding ground, but local knowledge is required to use it.

Stensnæs Flat, with ¾ fathom water over it, extends 1,200 yards from the shore about 1¾ miles southward of Stensnæs.

Buoy.—A conical red buoy surmounted by an upturned broom is moored in a depth of 2¾ fathoms, southeast of Stensnæs Flak.

Rimmen, connecting with the shore bank at its north and south ends, stretches from southward of Stensnæs to within ¾ mile of Gjeraa Village, a distance of nearly 7 miles. It has general depths of 1¼ to 2 fathoms, but on its western edge, nearly abreast of Söraa, is a shallow ridge a mile in length and a quarter of a mile in width, on which are depths of 2 feet.

Asaa Channel, the channel between Rimmen and the coast, is about half a mile in width, but the shore bank on its west side is very steep-to and mostly dry at low water. There is a depth of 2 fathoms at the north end and from 2½ to 3½ fathoms in the channel.

Buoys.—A white can buoy, surmounted by two down-turned brooms, is moored in 2¾ fathoms at the northeast end of Rimmen.

The western side of Asaa Channel is marked by nine spar buoys surmounted by brooms.

The eastern side of Asaa Rende is marked by nine spar buoys surmounted by straw wisps.

A conical buy, painted in red and white bands and surmounted by a ball, is moored in 2 fathoms water about 1 mile southward of the south end of Rimmen.

Asaa Harbor consists of an earthen dam or causeway extending 400 yards from the shore in a southeast direction, with the harbor at the extreme end formed by two small breakwaters, the northern, 350 feet in length, in the same direction as the causeway, and the southern, 200 feet in length, parallel to the northern, and with an arm 120 feet in length to the northeastward, leaving an entrance 65 feet in width between.

Depths.—There is a depth of 1¾ fathoms in the entrance and 1¼ fathoms in the harbor, but northwest winds raise the water 2 feet and southeast winds lower it 1 foot.

Communication.—There is a tramway to Broen, and post and telegraph offices. Asaa village had 684 inhabitants in 1906.

Supplies of provisions and water may be obtained.

Anchorage.—Good anchorage may be obtained northeast of Söraa, in a depth of 3¼ fathoms, or off Asaa in 2¼ fathoms, the bottom being fine red sand and clay, Asaa Channel being entered by crossing Rimmen either at its north or south ends.

Svitringen.—Between the south end of Rimmen and Hals the 3-fathom contour line is from 1¼ to 2 miles offshore and about 4½ miles from the coast, and parallel to it is Svitringen, a number of detached shoals with depths of from 2½ to 3 fathoms, which extend from Middel Ground for a distance of about 14½ miles to the southward. The southernmost patch of 3 fathoms is 6.4 miles southeastward of the northern entrance point to Lim Fiord and 100 yards northward of the line of the leading mark for the dredged channel over Hals Bar.

Eastward of Svitringen are several shoals extending across the southern approach to Læsö Channel, which will be found described in Chapter IV.

Buoy.—A red conical buoy, surmounted by three upturned brooms, is moored in a depth of 4¼ fathoms about ¾ mile southward of the southernmost 3-fathom patch of Svitringen.

Aalborg Bay, situated between the southern side of Svitringen and the shoals eastward of it, which lie across the southern approach to Læsö Channel on the north and Tangen on the south, a distance of about 15 miles, extends about 20 miles east and west and has general depths of from 5½ to 7 fathoms, except toward the coast of Jutland, where they are less; on this coast are the entrances to Lim, Mariager, and Randers Fiords.

Lim Fiord, which, first as a narrow channel for about 16 miles, and afterwards opening out into a chain of lakes, sounds, and short channels, cuts through the northern part of Jutland, converting the extreme northern portion of the peninsula into an island, is entered between Hals and Egense Points on the east coast and through Thyborön Kanal, which is subject to change, on the west, or North Sea coast. In 1910 there was a least depth of 9 feet in the whole channel.

There are several towns in its shores, but the description given in this work will only extend to Aalborg, on the south side of the channel and about 16 miles from the eastern entrance. For the western portion of Lim Fiord see North Sea, eastern shores.

Light.—About 3½ miles southeastward of Hals Point is a grey tower on a granite-covered base, the whole 66 feet in height, which exhibits, at an elevation of 59 feet above high water, a white group flashing light, visible 13 miles.

An auxiliary fixed light, with white, red, and green sectors (for which see Light List), is shown from the same tower at an elevation of 49 feet.

Fogsignal.—During thick or foggy weather a siren will give two blasts every minute, each blast being of three seconds' duration.

Pilots are stationed at the lighthouse.

Lights.—At Hals breakwater head, about ¾ mile westward of the north entrance point to Lim Fiord, a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 17 feet above sea level, from a wooden hut, 13 feet in height. The white and red lights are visible 9 miles, and the green 8 miles.

For leading lights at Hals, see Hals Harbor below.

On Egense, the south entrance point to Lim Fiord, a post, 62 feet in height, surmounted by a triangle apex downward, and painted red, exhibits, at an elevation of 62 feet above sea level, a fixed white light, which is visible 13 miles.

Dangers—Nordmans Hook.—From Torndal, about 3 miles northward of Lim Fiord, the shore bank commences to draw off the land, and at the north entrance point to the fiord forms a tongue, extending from it in a southeast direction, with banks which dry on it half a mile from the point. Skindsækken is a bight in the shore bank northward of Nordmans Hook.

Korsholm, the eastern side of which is about 1 mile east-southeast of Egense Point, is a dry bank about ¾ mile in length in a north and south direction, and surrounded by shoal water, which extends 1,200 yards southeast of it, and Kuje Ground, an extensive shoal, formed by a part of the shore bank, stretches 1½ miles southward of Korsholm, its eastern edge being that distance from the coast.

Lights.—Two octagonal-shaped red-light towers, 20 feet in stand on Korsholm, the northeastern or north front light being fixed green, exhibited at an elevation of 17 feet above sea level, and visible 6 miles.

The south front light, exhibited, at a similar elevation, from the southwestern of the two light towers, is fixed red, and should be visible 7 miles.

Depths.—The dredged channel over Hals Bar, which is about 200 feet in width, has a depth of 24 feet; inside the bar the depths in the channel are from 4 to 7 fathoms.

Beacons.—Two wooden beacons are situated on Korsholm; they are each 52 feet in height, the western surmounted by a ball painted red.

Bellbuoy.—A red and white striped bellbuoy, surmounted by a ball, is moored in a depth of 18 feet outside Hals Bar, 70 yards south of the line of Korsholm Beacons in one. It is replaced in winter by a conical buoy with a similar coloring and top mark.

Buoys.—The buoys marking the north side of Hals Bar are conical red, and surmounted by from one to three upturned brooms; those on the south side of the bar channel are white can, and have from one to three down-turned brooms as top marks.

The outer mark on the southwest side of Nordmans Hook is a red spar buoy surmounted by two upturned broms.

The southwest side of that shoal, and the northeast side of the entrance channel, is marked by 13 red spar buoys, each surmounted by an upturned broom.

The east side of Korsholm Ground is marked by a white spar buoy, surmounted by two straw wisps.

The northeast side of the same ground and the southwest side of the entrance channel, is marked by 11 white spar buoys, and each surmounted by a straw wisp.

At the north end of the ground a white spar buoy, surmounted by two straw wisps, is moored in a depth of 11 feet.

Egense Hook, shoal water extending northeastward of Egense Point, is marked on its northern side by two white spar buoys, each surmounted by a straw wisp.

Dredged channed signals.—Vessels having too great a draft of water to cross Hals Bar, except through the dredged channel, must, before entering either end of it, show the following signals:

By day.—Flags N.Z. of the International Code at the foremast head.

By night.—Steam vessels crossing Hals Bar by the dredged channel shall carry a red light, visible at least 2 miles, vertically below the white masthead light, and not less than 3 feet from it.

Sailing vessels, under similar circumstances, shall exhibit a red light at a height of at least 10 feet above the hull, and in such a position that it can not be mistaken for the red side light.

The above signals are to be shown until the vessel has passed through the channel.

During thick or foggy weather the signal will be four blasts on the steam whistle or foghorn, thus: Long, short, long, short.

A vessel being towed will display these signals.

Regulations.—If a meeting of two vessels in the channel is probable, the inward-bound vessel shall wait until the outgoing one is clear of it.

Vessels not obliged to keep in the channel shall, under all circumstances, keep out of the way of those requiring to do so.

Small vessels should keep on the starboard side of the channel, but if obliged to cross it, they should avoid getting in the way of large vessels.

Steam vessels should proceed carefully when passing dredgers, leaving them on the side on which a red flag is shown by day, or two white lights, placed vertically, are hoisted by night; the absence of the red flag by day or of one light by night indicates that it is not advisable to use the passage.

Anchoring in the channel is prohibited, but if compelled by necessity to do so, a berth clear of the fairway should be selected.

Pilotage is compulsory for vessels of, and over, 16 feet draft, and a pilot may be obtained from the lighthouse on making the usual signal.

Directions.—From the northward Jydske-Aas will be a guide, and farther south Hals white church, its mill, Korsholm Beacons, with the several light structures, and Muldbjerg, will point out the entrance. The red buoy (three brooms) marking the south end of Svitringen should be left to the northward to avoid the 3-fathoms patch of that shoal, which may also be cleared on its western side by keeping the western side of Jydske-Aas Hill in line with Hov Chapel, bearing about 342°.

Korsholm Beacons in line, bearing about 296°, lead across the bar in a depth of 19 feet, but with from 12 to 15 feet close southward of the line, so the mark for crossing is Egense light post, seen between the light towers on Korsholm, 294°, which leads through the dredged channel in a depth of 24 feet, passing between the buoys; when approaching Korsholm light towers, Haa Deep will open, and the course should be altered to 315° for the light hut on Hals Pier, passing between the spar buoys.

By night.—The sector of white fixed light from Egense light pole kept midway between the fixed green and red lights on Kor-

sholm, bearing 294°, leads through the dredged channel, and as the latter lights are approached the vessel will enter the fixed white sector from Hals breakwater, between the bearings of 314° and 316°, which will lead through Haa Deep.

Vej Deep, the southern channel, nearly 1 mile in length, is approached over Kuje Ground from about 1½ miles southward of Korsholm, the channel itself being entered about a mile southward of that bank, and passing westward of Korsholm; it is only suitable for small vessels.

The approach over Kuje Ground has depths of from 5 to 6 feet and the channel westward of Korsholm has from 4 to 6 fathoms.

Egense Deep, on the west side of Vej Deep, is a vein of deep water, in which the depths are from 12 to 18 feet; it is about a mile long in a north-northeast and opposite direction and surrounded by the shore bank.

Buoys.—A white spar buoy, surmounted by two straw wisps, is moored in a depth of 9 feet on the southeast side of Kuje Ground.

The southern end of the west side of Vej Deep is marked by four white spar buoys, each surmounted by a straw wisp; they are in from 3 to 5 feet of water.

Four spar buoys moored in 7 feet water mark the northern end of the west side of Vej Deep.

Muldbjerg Ground is a heap of stones on which the depth is 7 feet, lying about 3 miles eastward of the north end of Muldbjerg, a conspicuous hill, and fronting the entrance to the southern channel to Lim Fjord; immediately eastward of it is a deep hole about 1¼ miles in length in which the depths are from 3½ to 4 fathoms.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 24 feet about ½ mile eastward of Muldbjerg Ground.

Clearing mark.—Hals Church, seen between Korsholm Beacons, bearing 342° leads eastward of Muldbjerg, but is only a clearing mark for small vessels.

Directions.—Vej Deep, which is only suitable for very small vessels, has a general northerly direction, leaving the spar buoys marking the channel on the port hand.

Hals Harbor, ¾ mile westward of the northern entrance point to Lim Fiord, is a small harbor formed by two breakwaters extending in a southerly direction, the eastern for a distance of 720 feet, has a broad end, and on the outer part of the western side of this is the harbor, about 400 feet in length and 150 feet in width, the entrance being 50 feet in breadth.

There is a depth of 2 fathoms in the entrance, and depths of from 1 fathom to 1½ fathoms in the harbor. Gales from the westward and

northeastward raise, and those from east to south lower, the water in the harbor.

Leading lights.—A fixed light, with white, red, and green sectors is exhibited at an elevation of 17 feet, from a white wooden house, 14 feet in height on the breakwater head; the white and red lights are visible 9 miles and the green light 8 miles.

A fixed red light is exhibited, at an elevation of 39 feet above sea level, from a post on the breakwater head, and is visible 4 miles.

Pilots for the Bar, for Aalborg, and for the Belts may be obtained.

Anchorage.—The anchorage is in depths of from 3 to 5 fathoms, with good holding ground, between south and south-southwest of the breakwater; small vessels anchor sometimes on the northern side of Vej Deep.

Tides.—It is high water, full and change, at Hals, at 8h. 25m., the rise being about 1 foot.

Tidal streams.—The tidal streams run fairly regular. The mean rate of the flood stream is 1 knot, but the ebb always runs faster; and, in southerly gales, with a strong northerly current outside, it attains the rate of 4 knots. Under such circumstances the water may fall 3 feet below its ordinary level; and, on the other hand, it has risen even 5 feet above the ordinary level, when a storm has prevailed from northwest, which occasions a great influx of water; but these extreme changes of water level are rare.

Ice.—Owing to the stream the ice in either Haa or Vej Deep does not become very strong, and easily breaks.

Communication.—The nearest railway station is at Grandrup; there are post and telegraph offices.

Lange Rak, the channel between Hals and Bredhage, a distance of 12 miles in a northward direction, is from 400 to 600 yards in width, the land being low on both sides.

Shoal water, with depths of from 2 to 3 feet, and steep-to, fringes each side of the channel, and Bredhage, extending from a point on the south side, where the channel turns to the southwestward to Aalborg, is 600 yards from the shore. On the south shore, about 6½ miles from Egense, is the entrance to Gudumlund Canal. From Bredhage the channel has a southwest direction for about 3½ miles to Aalborg, with Sundby Hook, a shoal extending from a point on the north side, about a similar distance to Bredhage.

Leading lights.—Between Hals and Aalborg fixed white, red, and green leading lights are shown for the navigation of the channel. (See Light List.)

Mov.—At Mov, 2½ miles westward of Egense, there is an earthen causeway, 650 feet in length, with a mole head 65 feet broad at its extreme, where there is a depth of 12 feet.

Light.—A fixed green light is exhibited, at an elevation of 30 feet above high water, from a post, 26 feet in height, on the mole head.

Communication.—The railway station is at Storvorde, 5 miles distant; Mov, 1 mile distant, has a post office and a telephone to Aalborg.

Ferry.—A ferry crosses the fiord to the entrance of Gudlumlund Canal.

Buoys.—The channel to Aalborg is marked by spar buoys where necessary, for which see the chart.

Aalborg cement works.—On the southeast side of the fiord, opposite Sundby Hook, are four piers with crossheads which belong to a cement company, and have depths of from 12 to 22 feet alongside.

Light.—A fixed red lantern light is shown, at an elevation of 16 feet, from a post on the northeast end of the middle pier.

Warping buoys.—Two warping buoys are moored off the piers.

Communication.—There is telephonic communication with Aalborg.

Aalborg, which is the largest harbor in the north of Jutland, has three basins, Östre Havn, the eastern, Teglgaardshavn, the central, and Nyhavn, the western, Östre Havn, the largest of these, is about 900 feet in length, in an east and west direction, and about 400 feet in width, the entrance being 100 feet in breadth.

The quays, constructed of wood, filled in with earth, have a depth of 24 feet alongside them, and are lighted by electricity, with the railway running on them. There are several mooring buoys.

Lights.—For leading lights, see Light List and Chart.

On the western side of the entrance to Nyhavn, a fixed red and fixed green light is exhibited at an elevation of 30 feet. Leading lights are also shown, for which see Light List.

Depths.—In Östre Havn the depth is 24 feet, and in the other basins it is 14 feet; dredging is continually carried on. Northwest winds raise and those between east and southeast lower the water in the basins. Vessels that can cross Hals Bar use the harbor.

Bridges.—A pontoon bridge crossing the fiord immediately westward of the town has a swing opening, which is 65 feet in width; and 800 yards farther west the fiord is crossed by a railway bridge, with openings of 62 feet on either side of a central pillar, on which that part swings. There are warping buoys at the bridges.

Signals.—The signal to be made by a vessel wishing to pass through the bridges is the national flag hoisted not completely up to the foremast head, and the signals in answer are as follows:

One black ball.—The passage is barred.

Two black balls.—A vessel can pass from the eastward.

Three black balls.—A vessel can pass from the westward.

A blue flag hoisted in addition to the above.—The vessel must warp through.

The signals for the pontoon bridge are made from a staff at the north side of the passage; those for the railway bridge from a signal mast on the central pillar.

Directions.—The navigation of the fiord between Hals and Aalborg presents little difficulty, as the most extensive shoals offshore are buoyed, and the shore bank on either side generally shows by discolored water.

Vessels passing through the bridges are cautioned that the piers of the railway bridge project under water, so that they should be given a berth.

By night.—After passing Hals the various leading lights in the fiord kept in line lead through, and the fixed red sector from Nyhavn, bearing between 248° and 251°, leads up to the entrance of that basin in a depth of 18 feet.

Anchorage.—Vessels anchoring off Aalborg should be careful to avoid the telegraph cable which crosses the fiord.

Tides.—The rise of tide at Aalborg is about ½ foot.

Town.—Aalborg, one of the oldest towns in Denmark, is mentioned in the eleventh century. Its streets are crooked and narrow, with the gable ends of cross-beamed houses pointing toward them, some houses having outside galleries. The streets, although roughly paved, are clean and well kept. The old churches have been mostly rebuilt. The town has a museum, a hospital, and the Frederikskilde and Skovbakken are pleasant promenades. The population was 33,474 in 1910.

Harbor regulations.—Special harbor regulations are in force, a printed copy of which should be obtained from the port authorities.

Communication.—There is railway communication with Frederikshavn and Skagen to the northward, and Fredericia, and so with Copenhagen, to the southward.

Post and telegraph offices are situated at the harbor.

A ferry crosses the fiord to Nörre Sundby.

Coal and supplies.—About 4,000 tons of coal are kept in stock, and about 250,000 tons are imported annually. There is no special coal wharf, but vessels can coal alongside the quays or from lighters, of which there are 20 holding 60 tons. About 12,000 barrels of petroleum are kept in stock and between 8,000 and 9,000 tons are imported annually.

Fresh provisions may be procured and the town supply of water is laid on to the quays or is brought off in lighters, and it is not necessary to filter for small-tube boilers.

Patent slips.—There are 4 patent slips. The largest takes a vessel of 192 feet in length.

Repairs.—There are machine shops at the patent slips, where some repairs could be executed; a hand crane will lift 20 tons. A salvage vessel, which has diving appliances, is used in winter as an ice breaker.

Time signal.—A time signal, for rating chronometers, is given daily at the telegraph office at 1h. 0m. 0s. European mean time. (See Chapter I.)

Storm signals are shown from the west side of the entrance to Nyhavn and weather notices are shown on a board at the harbor. Additional storm signals are also given. (See Chapter I.)

Trade.—The principal export is agricultural produce, and the chief imports are feeding stuffs and coal.

Nörre Sundby, a town with about 3,500 inhabitants, occupies the shore on the north side of the fiord opposite Aalborg. It has a railway station and a pier for the ferry steamers crossing Aalborg, which has depths of from 10 to 14 feet at its end. A small harbor at Nörre Sundby has a depth of 4 fathoms near the quay and 3¼ fathoms near the pier.

Submarine telegraph cable.—A telegraph cable crosses the fiord about a third of a mile westward of Aalborg, and its shore ends are marked by red and white beacons. (See Chapter I.)

Coast.—From Muldbjerg the coast trending to the southward for a distance of 12 miles to Als Point is low and generally without woods. Mov Church, with a low, pointed spire, Muldbjerg, some mills near Hurup and Haslev, Als White Church, which stands high with mills to the southward of it, and, lastly, Als Point Beacon are the most conspicuous objects.

The 3-fathom contour line, which passes about 3¾ miles eastward of Muldbjerg, draws nearer the coast farther south, and is about 2½ miles distant from it; the shore bank southward of South Hurup begins to extend off the land until abreast of Als Point; it forms a tongue extending 1½ miles. Vessels load and discharge cargo by means of lighters off Hurup, 10 miles southward of Lim Fiord.

Als Reef, with a depth of 2 feet over it, and 10 to 11 feet around, lies 1 mile from the coast and 2 miles northeastward of Als Point.

Buoy.—A red spar buoy, surmounted by two upturned brooms, is moored in a depth of 13 feet on the northeast side of Als Reef.

Mariager Fiord, which, with a very winding course, extends for a distance of about 21 miles in a westerly direction to Hobro town, has its entrance, 1¼ miles in width, immediately southward of Als Point. On the north side of the fiord is Hadsund village, and on the south side, nearly 14 miles from the entrance, is Mariager town.

Light.—An unwatched fixed red light is exhibited, at an elevation

of 30 feet above high water from a post 22 feet high on the south side of Als Point; the light is visible 5 miles.

Entrance.—The channel into the fiord is between the tongue of shore bank already mentioned as extending 1½ miles eastward of Als Point, and a triangular bank, which dries at low water and extends for 2½ miles northeastward of the land on the south side, and which has Hasseltörre and Mejlplet, two islands, and Revlerne, a group of rocks, on it.

Depths.—The channel over the bar is dredged to a depth of 18 feet, and thence to the head of the fiord a depth of 17 feet; this channel extends for about 2 miles westward of Hadsund village, and then for about 7½ miles the fiord has depths of from 21 to 92 feet. In the channels leading to Cimbria, Darsia, and Kongsdal cement factories, and also at Dania and Kongsdal piers and in Mariager and Hobro Harbors, there is a depth of 17 feet.

Beacons.—On the bank extending eastward of Als Point is a beacon, 40 feet in height, surmounted by a triangle, apex pointing upward.

On Als Point another beacon, about 50 feet high, and surmounted by a triangle, apex pointing downward, when in line with the preceding, bearing 260°, leads through the dredged channel.

Buoys.—A conical red and white striped fairway buoy, surmounted by a ball, is moored 6 miles 147° from the beacon on Als Point.

A red bellbuoy is moored 500 yards northwestward from the fairway buoy, thence the channel to the outer end of the dredged channel is marked by two red spar buoys, the outer carrying two brooms as topmark, and the inner one broom.

The north side of the dredged channel is marked by 12 red spar buoys, each surmounted by an upturned broom.

The south side of the dredged channel is marked by 12 white spar buoys, each surmounted by a straw wisp.

The remainder of the channel is marked on the north side by red spar buoys, each surmounted by an upturned broom, and on the south by white spar buoys, each surmounted by a straw wisp.

Pilots are stationed at Als Point and board vessels at the fairway buoy if the signal has been made in time.

Anchorage.—The banks extending off the entrance afford anchorage for vessels in convenient depths.

Directions.—Owing to the narrow channel, it is imprudent to enter without a pilot. Als Church, on the north side, the beacons at Als Point, and Overgaard Tower, about 2 miles westward of the south side of the entrance, are all good guides for making the fiord,

and the beacons in line, bearing 260°, lead through the dredged channel, passing between the buoys.

Vessels, excepting those of light draft, should leave the fairway buoy, the bellbuoy, and the two red spar buoys mentioned above on the starboard hand when entering the channel from seaward.

Hadsund, on the north side of the fiord, and about 8 miles westward of Als Point, has a steamship and a ferry pier, with a depth of 12 feet at the former and from 4 to 6 feet at the latter.

Railway bridge.—A railway bridge crosses the fiord at Hadsund, and vessels should use the channel on their right hand unless signaled to the contrary by a yellow flag waved by hand.

Lights.—A fixed white lantern light is shown from each side of the swing pillars.

Submarine telegraph cable.—A telegraph cable crosses the fiord along the eastern side of the railway bridge.

Pilots for the fiord may be obtained, and there is a tug available.

Anchorage is prohibited within a distance of 200 yards of the bridge.

Communication.—A steam vessel plies to Mariager and Hobro; the railway station is on the south side of the bridge; post and telegraph offices in the village; a ferry runs to the opposite side of the fiord.

Supplies of fresh provisions and water may be obtained.

Mariager, situated on the south side of the fiord, about 5¾ miles miles west-southwest of Hadsund, has a mole with 14 feet water at its end and east side; also two small piers, which form a boat harbor, with depths of from 1 foot to 3 feet.

The small bay in which it lies is shallow, and shoals extend from the entrance points on either side.

Buoys.—The extreme of the shoal on the eastern side is marked by a white spar buoy, surmounted by a straw wisp, and that on the west side by a red spar buoy, surmounted by an upturned broom.

Town.—Mariager town is small, with about 950 inhabitants; a hill 362 feet high, to the southeast of the town, is conspicuous.

Communication.—A small steamer plies between Mariager, Hobro, and Hadsund; the nearest railway station is at Norup, about 5 miles distant; post and telegraph offices in the town. There is a small slip with lifting power 20 tons.

Hobro, a small harbor on the south side of the head of Mariager Fírod, has a depth of 17 feet alongside the wharves, and is approached by a channel in which there are the same depths. Blaakilde mill pier, 400 yards eastward of Hobro, is built of wood and has 14 feet alongside.

Buoys.—The northern side of the channel is marked by red spar buoys, each surmounted by an upturned broom, and the southern side by white spar buoys, each surmounted by a straw wisp.

Town.—The town of Hobro has a population of about 3,300.

Communication.—A small steam vessel plies between Hobro and Hadsund, calling at Mariager; branch railways run to Aalestrup, Aars, and to Logster; there are post and telegraph offices in the town.

Repairs.—Small repairs might be effected at a workshop, and there is a crane which will lift 8 tons.

Piers.—In addition to the above small harbors there are cement-work piers at Hadsund and Kongsdal and the Cimbria and Dania piers eastward of Mariager; the depths at these piers are 17 feet.

Ice.—Average ice conditions, see Appendix.

Coast.—From the entrance to Mariager Fiord the coast bends round from southeast to southwest for about 6 miles to the entrance to Randers Fiord, the most conspicuous objects being Södring Church, Södringholm Wood, and Demstrup Mill, with Raaby Church standing high to the southwestward of the latter.

Boels Reef, situated 2½ miles east-northeast of Södring Church, is a large stone, with a depth of 3 feet over it, lying 1 mile off-shore; a rock, with 12 feet water over it, lies near the edge of the 3-fathom contour and 1 mile east-northeast of Boels Reef.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 12 feet, about 400 yards eastward of Boels Reef.

Boels Flat, 2¼ miles in length in a northwest and opposite direction and about 1¼ miles in width, with depths of from 15 to 18 feet over it, lies 1½ miles eastward of Boels Reef.

Buoy.—The southeast extreme of Boels Flat is marked by a red conical buoy, surmounted by an upturned broom, moored in 23 feet water.

Randers Fiord, entered over a bar between Södring and Udbyhöj, has two inner entrance points 2 miles within the bar, where it is about a quarter of a mile in width, and from these the fiord has a general south-southwest direction for 8½ miles to Ugelhuse, and then turns westward for nearly 6 miles to Randers.

Light.—From the gable of a white building, 20 feet in height, standing on Elkjær Bakke, the south entrance point to the fiord, a fixed, flashing, and group flashing light, with white, red, and green sectors, is exhibited at an elevation of 115 feet above high water; the white, red, and green lights being visible 16, 15, and 13 miles, respectively. (For bearings of sectors, see Light List.)

Entrance.—The shore bank extending southeastward of Södring for about 1¼ miles, has Mellempolde and another small islet on it,

and forms the northern side of the entrance channel, the southern side of which is the shore bank extending northeast of Udbyhöj; the width of the dredged channel is from 100 to 160 feet, and that of the channel of the fiord 55 to 65 feet.

Depths.—The depth on the bar is 18 feet, increasing quickly to 4 fathoms inside.

Beacons.—A beacon, 60 feet in height, and surmounted by a ball, is situated on the point of the shore bank, which extends 1⅛ miles northeast of Udbyhöj Lighthouse, and is on the south side of the entrance, a concrete pillar stands on the shoal northward of the channel and northward of the lighthouse.

Fairway buoys.—The fairway buoy, conical, striped red and white, and with "Randers Fiord" on it, is surmounted by a ball; it lies on the line of the beacons about 800 yards eastward of the entrance to the channel over the bar, and in winter it is replaced by a similarly striped spar buoy.

Bellbuoy.—A red bellbuoy is moored in a depth of 18 feet at the entrance to the channel, and on the north side of the line of the leading marks for entering. In winter it is replaced by a red spar buoy, surmounted by a red flag.

Dolphin.—A dolphin with a cross topmark, surrounded by ice breakers, is erected on the eastern side of the channel in 8 feet of water.

Buoys.—The northern side of the entrance channel is marked by five red spar buoys, each surmounted by a broom, except the easternmost, which has two brooms, and the south side by five white spar buoys, each surmounted by a straw wisp, except the easternmost, which has two wisps.

From the bar to Randers, the starboard side of the channel is marked by red spar buoys, with and without upturned brooms.

On the southern edge of the same part of the channel are white spar buoys, with and without straw wisps.

Anchorage.—The best anchorage outside the bar is in a depth of about 21 feet, northeastward of the fairway buoy.

Pilots for the fiord, as well as for Frederikshavn and the Belts, may be obtained at Udbyhöj; they may also be procured at the town.

Tug.—A powerful tug is available; it is used in winter as an ice breaker.

Directions.—Owing to the narrowness of the channel and the strong stream, it is imprudent to enter without a pilot, unless possessing local knowledge.

When pilots are prevented by bad weather from coming out, small vessels, not drawing more than 8 to 10 feet, can cross the bar and anchor between the beacon and Kirke Ground, where there is room

for two or three vessels. Larger vessels must wait until the pilot is able to come out.

Södring and Raaby Churches, on the north, and Udbyhöj Light Building, with Udby Church and mill (the latter with a thatched roof) on the south side of the entrance, are marks for the entrance, and coming from the north the channel between Boels Flat and Tangen, which is 2½ miles wide, may be taken, rounding the buoy marking the southeast end of the former shoal, and steering about 282°, to bring Udbyhöj Light Building in line with the beacon, bearing 238°, which is the mark for crossing the bar, but it would be advisable to take a pilot.

By night.—The white double flashing light from Udbyhöj, bearing 254°, leads southward of Boels Flat.

Tidal streams.—The flood sets to the southward and the ebb in a contrary direction outside the bar.

Udbyhöj Pier, situated on the north side of the entrance to the fiord, has a depth of 6 feet alongside, and the winter harbor connected to it has an entrance 50 feet in width and a depth of 12 feet, but northerly winds raise, and southerly winds lower, the water about 3 feet.

Communication.—There is a telephone station at the pier, but the nearest railway, post, and telegraph is at Havndal, 3 miles distant.

Supplies of provisions and water may be procured.

Voer Pier, on the east side of the fiord, about 6 miles from Udbyhöj Pier, is 590 feet in length, with a T head, 56 feet in length, in a north and south direction, and a depth of 15 feet alongside.

Communication.—The nearest railway is at Allingaabro, distant 5 miles, and post and telegraph at Örsted; a ferry crosses the fiord at Mellerup.

Mellerup Ferry Pier, opposite Voer, has a depth of 3 feet alongside.

Ugelhuse Pier, 3 miles south of Voer Pier, has a depth of 6 feet alongside, but northerly winds raise and southerly winds lower the water about 2 feet.

Communication.—There is a post and a telegraph office at Ugelhuse Grund Fiord, an arm extending about 3 miles to the eastward of Ugelhuse, with depths under 6 feet.

Randers Harbor is formed by two small islets in the fiord, which are connected to the north shore; it has a grain elevator.

There are depths of from 13 to 19 feet in the harbor, and the latter depth alongside the pier, but northerly winds raise the water about 5 feet and southerly winds lower it about 3 feet.

Ice.—Average ice conditions, see Appendix.

Town.—The town, situated on the north side of the fiord, has a population of 23,000.

Communication.—Railway lines run to the northward to Hadsund, to the eastward to Ryomgaard, and to the southward to Aarhus, the station being at the harbor; there are post, telegraph, and telephone offices.

Coal and supplies.—Some coal and fresh provisions might be obtained; water can be obtained at anchorage in harbor by means of pipes.

Slip.—There is a patent slip, with lifting power of 50 tons.

Repairs to hull and machinery may be effected.

Time signal.—A time signal for rating chronometers is given daily at the telegraph office at 1h. 0m. 0s. mid-European time. (See Chapter I.)

Trade.—The exports principally consist of agricultural produce, and imports of feeding stuffs and coal.

Coast.—From the entrance to Randers Fiord the coast trends to the southeastward to Hevring fishing village, and is low and wooded; it then turns to the eastward for about 12 miles to Stavns Hoved, and is generally low.

The most conspicuous objects are Estruplund Church, with a red roof; Hevring Mill; Fjellerup Church, surrounded by woods; Herregaarden Mejlgaard, with a red roof and spire; and Treaa Mill, close to the sea.

Hevring and Fjellerup Flats.—Between Udbyhöj and Hevring the shore bank extends about ½ mile off, and the 3-fathoms contour line, which is 1½ miles eastward of the former, increases its distance to 2 miles off Hevring, the bank inside it, with a depth of 12 feet, being known as Hevring Flat. Eastward of Hevring the 3-fathom contour line approaches the shore to rather less than 1 mile, and outside it is Fjellerup Flat, two patches with 16 and 18 feet water over them.

Tangen Bank, an irregularly shaped shoal nearly 13 miles in length in an east and west direction, and 6½ miles in greatest width, within the 4-fathoms contour line, lies to the northward of the coast between Fjellerup and Gjerrild Lighthouse.

The depths on the bank are uncertain, especially near its western end in an area about 5½ miles in length in a northwest and opposite direction and 3½ miles in greatest width, within the 3-fathoms contour line, where, on the southwest part, a shoal about ½ mile in extent, the position of which is approximate, dries at low water, and other shoal patches may exist; the bottom is generally fine white sand, with patches of weed, and here and there rock or stones.

The northeast extreme of the bank is about 8½ miles northward of Gjerrild Lighthouse, and the eastern shoal of 3 fathoms is 5 miles northeast of the same; between the bank and the mainland is a chan-

nel with depths of from 4½ to 6 fathoms from the westward as far as Gjerrild Lighthouse, but eastward of it the bank is apparently joined to the mainland by a narrow neck of 3½ fathoms.

A detached patch of 3½ fathoms lies 1½ miles outside the 5-fathoms contour line at the northeast end of the bank, and is 9¼ miles north-northeast of Gjerrild Lighthouse.

Light and whistlebuoy.—A red buoy, exhibiting an occulting white light 7½ seconds, and fitted with a whistle, is moored in a depth of 6½ fathoms 200 yards eastward of the 3¾-fathoms patch. The buoy has "Tangen NE" painted on it, and in winter is replaced by a conical red buoy.

On the northwestern side of the bank is moored a lightbuoy painted white marked "Tangen NW." and showing a flashing white light every 5 seconds. In winter the light buoy will be replaced when necessary by a white-spar buoy.

Buoys.—The north buoy, moored in a depth of 3¼ fathoms on the north side of the bank, is a white can, and surmounted by two down-turned brooms.

The east buoy, conical red, and surmounted by three upturned brooms, is moored in 5 fathoms water 200 yards eastward of the 3-fathoms eastern patch.

The southwest buoy, conical red, and surmounted by two upturned brooms, is moored in a depth of about 4 fathoms on the southwest side of the bank.

Wreck buoy.—A lightbuoy, showing a flashing green light, is moored 328 yards 45° from the wreck of the motor schooner *Peter*. The wreck lies about 7 miles 230° from Tangen NE. light and whistle buoy.

Directions.—The bank can be crossed in a least depth of 3 fathoms by keeping Glesborg church just open westward of the highland between Stavns Hoved and Treaa Mill, bearing 174°.

By night.—The sector of fixed white light from Udbyhöj Lighthouse, between the bearings of 276° and 279°, leads along the south side of Tangen Bank, but the latter bearing leads over the southern edge in a depth of 3 fathoms.

The sector of flashing red light from the same lighthouse, bearing 245°, leads northward of the western part of Tangen Bank.

Coast.—Treaa Mill is situated nearly 4 miles eastward of Fjellerup, the shore bank, which is a mile off the latter, being only about ½ mile off at the mill; this part is named Skjerbæk Spit, and about a mile farther eastward is Stavns Hoved Reef, with a bay formed between; these spits are somewhat steep-to, with 3 to 4 fathoms outside them, but from their white appearance may be seen from some distance.

Anchorage.—There is anchorage along this shore from off Hevring and Fjellerup Flats, where the holding ground is good and some protection is said to be given by Tangen Bank in northeasterly winds; vessels may also anchor off the west end of that bank, receiving some protection from it, with a good holding ground of clay and sand.

In the small bay formed by the spits above mentioned there is also anchorage, but not in a less depth than 4 fathoms abreast the mill, on account of rocky ground closer in; both northerly and southeasterly winds raise a heavy sea, and with such it would be necessary to leave it.

Light.—From the gable of a brown wooden building, 13 feet in height, situated on Knudshoved, a group flashing white light is exhibited at an elevation of 60 feet above high water and visible 13 miles. The lighthouse is not conspicuous.

Coast.—The coast from Knudshoved trends to the south-southeastward, for a distance of 6¼ miles, to Fornæs, and between is Gjerrild Bay, Gjerrild Cliff, and Sangstrup Cliff, Gjerrild Cliff being a white cliff, forming a good mark; the most conspicuous objects are Benzon and Stensmark mansion houses, with red towers, Gjerrild church, standing about 1 mile westward of the bay, and Fornæs Lighthouse to the southward.

Gjerrild Flat, with depths under 4 fathoms, extends for a distance of 2 miles eastward of Gjerrild Cliff, and has a small patch of 2½ fathoms on it about 1½ miles eastward of the lighthouse.

The 4-fathom contour line is about ½ mile from the shore of the bay, but outside it and ½ off Sangstrup Cliff there is a 2¾-fathom patch, surrounded by depths of 4 and 5 fathoms, and ¾ of a mile northeastward of this patch is one of 4½ fathoms.

Anchorage.—Gjerrild Bay affords good anchorage, with off-shore winds, the holding ground being good, but with on-shore winds there is considerable swell, and owing to the tenacious nature of the bottom there might be a difficulty in weighing. The best protected anchorage is in a depth of 3½ fathoms with Rimsö church in line with the southern end Gjerrild Wood, bearing about 243°.

Fornæs, the eastern extreme of Jutland, is 26 feet high, and tolerably steep on its seaward side; the lighthouse is on a low point with a bluff behind it.

Light.—On the point is a cylindrical granite tower, 89 feet in height, which exhibits, at an elevation of 105 feet above high water, a flashing white light; it should be visible 16 miles, but is obscured to the northward by Gjerrild Cliff, and to the southward by Havknude.

Fog signal.—Two fog sirens, situated on an iron support, 44 feet in height, at 40 yards southeast of the lighthouse, each give simulta-

neously one blast of about four seconds' duration every minute, one sounding strongest in a northeasterly direction, the other in a southeasterly direction.

Lloyd's signal station.—A signal station, about 50 yards eastward of the lighthouse, is connected with the telegraph system, and vessels can communicate with it by the International Code.

Life-saving station.—A rocket apparatus is maintained at Fornæs.

Ice signals are made, and those relating to lightvessels, the house on which they appear being immediately northward of the fog signal and facing east. (Ch. I.)

Coast.—Southward of Fornæs the coast trends in a south-southwest direction for a distance of 6½ miles to Havknude, and rising somewhat at first, at about 2 miles from Fornæs, lowers toward the sea in a steep cliff, after which it is low till near Katholm, where there are some wooded hills, again becoming lower at Havknude, which is a broad, projecting cliff of no great height.

The most conspicuous objects are Hammelev white church; Bavne mill, high lying, with a shrubbery on its north side; Grenaa limeworks with a tall chimney; and Grenaa, Ensley, and Aalso churches, the second with a red and the last with a slate roof. Katholm mansion house and Aalso mill, standing high, are also noticeable.

Dangers.—The coast bank deepens somewhat abruptly to 3¼ fathoms along the whole stretch of coast between Fornæs and Hasnöre, with several shoal and rocky patches on a sand flat extending 1 mile off.

A small heap of stones, about 80 yards in extent in an east and west direction, with a depth of 1¾ fathoms over it and 3 to 4 fathoms around, lies 350 yards from the coast about ½ a mile southward of Fornæs Lighthouse.

Lille Reef, with a depth of 3 feet over it, is the same distance from the land about ¾ of a mile southwest of the above.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 3 fathoms eastward of Lille Reef.

Kalk Ground, a rocky bank, with a least depth of 4 feet at its east end, is about 800 yards in length in an east and west direction within the 2-fathoms contour line, and steep-to all around; it lies 1 mile offshore east-northeast of Grenaa Havn, and is surrounded by depths of 4 and 5 fathoms.

Buoys.—The southeast end of Kalk Ground is marked by a conical red buoy, surmounted by two upturned brooms moored in a depth of 4½ fathoms.

A white can buoy surmounted by a down-turned broom is moored in a depth of 2 fathoms on the west end of the ground.

Bayne Mill open north of Roelshöj leads north, and the same mill in line with three small equal-sized houses on the coast near the lime kiln leads south of Kalk Ground.

Naveren, about 1 mile southward of Kalk Ground, extends 1 mile from the coast, and at ⅜ mile off there is a depth of 4 feet, with from 8 to 9 feet on the remainder; a patch with 3¾ fathoms water over it lies ½ mile eastward of Naveren.

Buoy.—A red conical buoy, surmounted by an upturned broom, is moored in a depth of 5½ fathoms northeastward of the 3¾-fathoms patch.

Clearing marks.—Jernhatten Point open of Havknude, bearing 215° leads southeastward of Kalk Ground and Naveren.

Grenaa Havn, at the mouth of a stream that flows from Kolind Lake, is formed by two breakwaters, the northern extending in an easterly direction for 722 feet, with a bend to the southeast, and the southern parallel to it for 1,110 feet, then turns to the northeastward for 650 feet, leaving an entrance, facing northeastward, between the heads about 160 feet in width, the area inclosed being about 7½ acres.

There is a depth of 15 feet at the entrance, 14 feet in the harbor, and 12 feet alongside the breakwaters; gales from between northwest and north raise the water from 4 to 6 feet and those from between east and south lower it about 6 feet.

Lights.—On the east molehaed a circular gray tower, 23 feet in height, exhibits at an elevation of 26 feet above high water, an occulting light with white, red, and green sectors; the while light is visible 9 miles, the red light 6 miles, and the green light 5 miles.

This light is in line with the fixed white light on the south breakwater bearing 223°.

Leading lights.—A fixed green light is exhibited, at an elevation of 17 feet above high water, from a pole on the west molehead.

A fixed white light is exhibited from a white pole on a small house situated on the south breakwater about 200 yards within its head.

The lights are in line bearing 204°. (For sectors, see Light List.)

Anchorage.—There is anchorage, with good holding ground, near Fornæs, and between Kalk Ground and Naveren, which afford some shelter; the depths are from 3½ to 4 fathoms, but further out the bottom is foul.

Pilots for the harbor, and for the Sound and Belts, may be obtained.

Warping buoy.—There is a warping buoy about 150 yards 57° from the south breakwater head.

Tides and tidal streams.—In calm weather there is a regular ebb and flow every six hours, the ordinary spring range being 2 feet.

The north-going stream is usually weak, but that to the southward with a gale blowing from any quarter between northwest, through

north, to east, and particularly at its commencement, sets very strongly to the eastward across the entrance to the harbor. With ice in the fairway, particular care is necessary to avoid being set by this current onto the north breakwater.

Ice.—Average ice conditions, see Appendix.

Town.—Grenaa, a town with 3,462 inhabitants in 1906, is situated about 1½ miles from the harbor.

Communication.—The harbor and town have railway communication with Aarhus, about 41 miles distant, and with Randers, via Ryomgaard, the line coming down to the principal quay; the harbor is also connected by telephone with the town, and there are post and telegraph offices.

Coal and supplies.—Some coal might be obtained, there being about 1,500 tons in stock in 1910; also fresh provisions and water, which latter can be obtained at anchorage in the harbor by means of pipes.

Slip.—There is a patent slip with lifting power of 25 tons.

Repairs.—Small repairs might be effected at an iron foundry and a machine shop.

Life-saving station.—A lifeboat is stationed at Grenaa.

Havknude Flat, commencing about ½ mile southward of Naveren, extends in an easterly direction about 1½ miles from the shore, 1 mile northward of Havknude. The 5-fathom contour line surrounding it is about 2 miles from the shore for a similar distance parallel to the coast, and inside it are several shoal patches with from 2¼ to 2¾ fathoms; the bottom is sand.

Two rocky shoals, with 4¼ fathoms water over them, lie nearly 2½ miles eastward of Havknude, and are surrounded by depths of from 5 to 8 fathoms.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 7 fathoms eastward of the eastern 4¼-fathoms patch.

Clearing mark.—Hammerlev Church, well open eastward of Grenaa limeworks chimney and Roelshöj, bearing about 331°, leads eastward of Havknude Flat.

Anchorage.—With off-shore winds good anchorage may be obtained on Havknude Flat, and in the bay southwest of Jernhatten, the holding ground being good everywhere.

Coast.—The coast from Havknude trends southwestward 7 miles to Jernhatten, a broad projection of the coast, on which is a conspicuous hill partly wooded, having a white cliff on its southeast side, and Holme mill close to it. Another conspicuous building on this stretch of coast is Rugaard mansion house; shoal water extends only a short distance from this shore, which, just northward of Rugaard Wood, is somewhat foul.

Rothe Ground, a rock with 1¼ fathoms water over it, lies 800 yards from the shore and 3½ miles southwestward from Havknude.

Jessen Ground, with 1¾ fathoms water over it, and steep-to on all sides, lies on the extreme of a tongue of shoal, nearly 1 mile offshore, and 1¾ miles east-northeast of Jernhatten. Between it and the beach is a 2½-fathoms shoal.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 4 fathoms eastward of Jessen Ground.

Clearing mark.—Draaby Church, well open southward of Jernhatten, bearing about 250°, leads southward of Jessen Ground.

Coast.—From Jernhatten the coast trends in a south-southwest direction for a distance of 6¾ miles to Hasenöre, the most conspicuous marks being Rugaard mansion house, Draaby Church and mill, with Karlsbjerg, a high hill southward of them, and farther south Skjelhoj; Kobbergaard is a large group of buildings near the shore, and southward of a high cliff, while again farther south is Elsegaarde wood and Gydehöj. Hasenöre has a small wind motor, such as is used for pumping water, on it.

Blak, a rock which dries at low water, is situated to the southward of Jernhatten, and about 300 yards offshore, and about 600 yards southeast of Blak is a rock with a depth of 2¾ fathoms over it.

Holmesten, nearly awash, lies in the bay southwestward of Jernhatten, and about 500 yards from the coast between Holme and Draaby villages.

Shoal.—A shoal with a depth of 2 fathoms over it lies about ½ mile offshore abreast of Gydehöj, a hill about 1 mile northward of Hasenöre.

Klokke Ground, a small rocky shoal with a depth of 1¼ fathoms over it, lies nearly 1 mile east-southeast of Hasenöre, and close inside the 5-fathoms contour line; about 300 yards eastward of Klokke Ground is a shoal with some large rocks and with 2½ fathoms water over it; the depths increase rapidly to the eastward of these shoals.

Buoy.—A red spar buoy, surmounted by an upturned broom, is moored in about 5 fathoms water 100 yards southeastward of Klokke Ground.

Hjelm, an island about 1,200 yards in length in a northeast and opposite direction, is of fairly even height with a copse-covered hill, which is conspicuous; it lies 2¾ miles east-southeast of Hasenöre with Hjelm Deep between.

On its eastern side is a bank about 1½ miles in length in a north and south direction, which extends nearly 1 mile northeast, about ½ mile east and ¾ mile southeast of it, and has general depths of 1¼ fathoms over it, but ¾ of a fathom on the northeast edge.

Light.—On the summit of Hjelm a cylindrical white tower, 59 feet in height, exhibits, at an elevation of 164 feet above high water, a fixed and flashing white light, visible 19 miles.

Hjelm Bank, which surrounds the island, is within the 10-fathoms contour line about 9 miles in length in a north-northeast and opposite direction, with a greatest width of about 5 miles; the northern edge is about 4¾ miles northeast, and the southern edge about the same distance south of the island.

The bottom over the whole bank is hard sand and stones, mixed with gravel resembling coral; in the deep channels there is a loamy mud and slime.

Anchorage.—On all parts of the flat surrounding Hjelm there is anchorage, but the best is on the northwestern side. The best landing place is on the west side, a little southward of the north point.

Landmarks.—Skjelhöj, a hill near Ebeltoft, is remarkable for having two small hummocks, and Gydehöj, about 2½ miles south-southeast of it and near the east coast, is midway between Kobbergaard and Hasenöre.

Ellemandsbjerg, a dome-shaped hill 326 feet high, its northern part wooded and southern part grass land, is situated on the southern part of Helgenæs. From its prominent and conspicuous position it forms a valuable landmark for vessels entering the Great Belt, or bound for any of the ports of Jutland in its vicinity.

Tvillingerne, on the northwest corner of Hjelm Bank, and nearly 3 miles 12° from Hjelm Lighthouse, are two rocky shoals, with 2½ fathoms on the northwest and 2¼ fathoms on the southeast shoal.

Buoy.—The northwest side of the shoals is marked by a white can buoy, surmounted by two down-turned brooms, moored in a depth of 4¾ fathoms.

Clearing mark.—Ellemandsbjerg, in line with Gydehöj, bearing 250°, leads northward of Tvillingerne in a depth of 3¾ fathoms.

Nord-öst Pullerne are three rocky shoals; the outermost, with a depth of 3 fathoms over it, lies 1¼ miles northeastward of Hjelm Lighthouse, and the innermost, with ¾ fathom water over it, is about 1 mile 57° from the same.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 3 fathoms, northeastward of the innermost shoal.

Clearing mark.—Skjelhöj, well open north of Kobbergaard, bearing about 298°, leads, in a depth of 5 fathoms, northward of the 3-fathom shoal of Nord-öst Pullerne.

Öst Pullerne are three rocky shoals, with depth of from 3 to 3½ fathoms over them, which lie 1¼ miles eastward of the lighthouse.

Klör Ground, a rocky reef, about 200 yards in length in a northwest and opposite direction, has a least depth of 1¼ fathoms over it, and lies fully a mile southward of the lighthouse.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 3½ fathoms, 400 yards southward of Klör Ground.

A patch of 2¾ fathoms lies 270 yards eastward of the buoy.

Syd Puller, lying about 1 mile south-southeast of Klör Ground, has 3 fathoms water over it, with a depth of 3½ fathoms between the shoals.

Bjarkes Ground, a sand bank lying on the southwest side of Hjelm Bank, about 2½ miles 192° from the lighthouse, is a mile in length, in a northwest and southeast direction, within the 5-fathom contour line. The general depths on the shoal are from 2¼ to 2¾ fathoms, but in the center is a spot with 1¾ fathoms.

Buoys.—A white can buoy, surmounted by three downturned brooms, is moored in a depth of 4 fathoms 200 yards northward of the northwest end of Bjarkes Ground.

A red conical buoy, surmounted by an upturned broom, marks the southeast end, from which it is distant 200 yards in a depth of 4¾ fathoms.

Clearing marks.—Jernhatten, touching the southwest point of Hjelm, bearing north, leads eastward of Bjarkes Ground in a depth of 8 fathoms. Skjelhöj, in line with one-third of Elsegaarde wood, from the eastward, bearing 341°, leads westward, and Dyrehöje, its own breadth inside Gaasehage, 305°, leads northeastward.

Mosel Ground, which lies on the southern part of Hjelm Bank, is composed of sand and is about 3¼ miles in length in a northeast and opposite direction, with a greatest breadth of 1¾ miles. It has general depths of from 3½ to 4¾ fathoms, but near its southwest end there are two patches with 2 and 3 fathoms, respectively.

Light-and-whistle-buoy.—A red buoy, with "Mosel grund" in white letters on it, exhibiting an occulting white light, which is eclipsed eight times every minute, and also sounding a whistle, is moored in a depth of 13 fathoms southward of the bank. In winter it is replaced by a red spar buoy.

Buoy.—A white can buoy, surmounted by a downturned broom, is moored in a depth of 4 fathoms about 400 yards northeastward of the 2-fathom patch of Mosel Ground.

Clearing marks.—Skjelhöj, in line with the east edge of Elsegaarde wood, bearing 337°, leads westward of Mosel Ground.

Karlsbjerg, in line with the southwest point of Hjelm, 335°, leads across the ground, northeastward of the 3½-fathom patches on it.

Yder Flak, consisting of a rocky head with a depth of 3¾ fathoms over it and a patch of 4¼ fathoms southward of it, lies about 6 miles east of Mosel Ground.

Buoy.—A red and white horizontally striped conical buoy, surmounted by a ball, is moored in a depth of 4½ fathoms northeastward of the 3¾-fathom rocky head.

Hjelm Deep—Shoal patches.—Hjelm Deep, the channel between Hjelm Bank and Jutland, has depths of from 12 to 25 fathoms, and a least breadth of 1¼ miles between the 10-fathom contour lines; but in mid-channel of its northern part are two patches of 3 fathoms situated on a bank westward of Tvillingerne, and 1¼ miles northward of Tvillingerne is a patch with a similar depth, having a patch of 3¾ fathoms about 1 mile east-southeast of it; the bottom on these banks is coarse sand.

Clearing mark.—Ellemandsbjerg, in line with Gydehöj, bearing 250°, leads northward of the first two patches.

Caution.—Owing to the number of dangers outlying Hjelm it should be approached with considerable caution by night, and not to a less depth than 7 fathoms on its eastern side.

Current.—The current generally runs with considerable strength through Hjelm Deep.

Coast.—Hasenöre and Gaasehage are the southeast and southwest points of a peninsula which forms the east side of Ebeltoft Bay, and from the latter to Alhage, a low point, the coast is generally flat, with low cliffs. Southward of Ebeltoft two small woods and Bögebjerg, a hill, are conspicuous.

Helgenæs, a peninsula about 3½ miles in length in a north and south direction, 2½ miles in width, and joined to the mainland by Draget, a narrow isthmus, is, with a few exceptions, generally low; and of these Ellemandsbjerg has been already described. Helgenæs forms the western side of the entrance to Ebeltoft Bay.

Light.—On Sletterhage, the low southwest point of Helgenæs, a circular white tower, 52 feet in height, with a gray roof, exhibits, at an elevation of 56 feet above high water, a fixed, flashing, and group-flashing light, with white, red, and green sectors; the light is visible 13 miles. For sectors of the light, see Light List.

Fog signal.—During thick or foggy weather a fog siren gives two blasts, one long and the other short, in quick succession, every minute. The signal sounds loudest from a southerly direction.

Semaphore—Beacon.—A semaphore is situated near the lighthouse; also a small white beacon, surmounted by a black ball. Two conspicuous white buildings stand just northward of the lighthouse.

Submarine telegraph cable.—A submarine telegraph cable connects Sletterhage with Issehoved, the north point of Samsö, and two

white telegraph poles, surmounted by triangles, on Sletterhage, mark the shore end.

Dangers.—From Hasenöre to Gaasehage, and nearly to Alhage, also on the west side from Sletterhage to midway of the east side of Helgenæs, the 3-fathom contour line is about ⅔ mile offshore, but southward of Hasenöre and across the entrance to Elbetoft Bay are several outlying dangers:

Oreringene, a small heap of stones, lying on a flat, surrounded by deep water, is situated about 2 miles southward of Hasenöre; the two shoalest spots lie about 70 yards from each other, the southern having a depth of 2¼ fathoms over it and the northern slightly less; a shoal of 3¾ fathoms lies about 800 yards northward of them on the same flat.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 4¾ fathoms 200 yards southeast of the southernmost shoal of Oreringene.

Öre Flat.—About 1 mile southward of Gaasehage, and extending for 2 miles in an east and west direction, with a breadth of 1½ miles, is Öre Flat; it has a general depth of 2¼ fathoms over it and 2¾ on its southern prongs.

Öreflippen, a small patch, with a depth of 2¼ fathoms over it, is situated about ½ mile southward of Öre Flat.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 3¾ fathoms, about 200 yards southeastward of Öreflippen.

Skade Ground lies about 1 mile eastward of Lushage, the southeast point of Helgenæs, and extends about 1½ miles in a north and south direction, with a greatest width of nearly 1¼ miles; it has general depths of from 1¼ to 2 fathoms, but a patch of ¾ of a fathom is situated on its southwest edge. The shoal, which is fairly steep-to, is composed of sand and small stones.

Buoys.—A conical red buoy, surmounted by two upturned brooms, is moored in 6½ fathoms water 200 yards from the southeast end of Skade Ground.

A red buoy, surmounted by one upturned broom, marks the southwest end, in a depth of 6 fathoms.

Shoals.—Shoal water, with depths of from 2 to 2¼ fathoms, extends, for a distance of ¾ of a mile, from the east side of Helgenæs, at about 1¾ miles northward of Lushage.

A shoal, with 2¾ fathoms water over it, and composed of sand and small stones, lies about 1½ miles east-southeast of Draget Isthmus, which connects Helgenæs to the mainland.

Directions.—Coming from the northward, and being near the parallel of Jernhatten, there are several routes available, if bound

to Ebeltoft or Arhus Bay, but for the majority of the channels it would be necessary to trust to the buoyage, as few leading marks can be given; a range finder will be found exceedingly useful.

Vessels can pass eastward of Hjelm, but there is no leading mark for the deepest water between Klörgrund and Mosel Ground, and the same may be said for the channel between Mosel Ground and Marthe Flat.

Vessels can proceed either to the northward or southward of Tvillingerne and westward of Hjelm, and if the former, Ellemandsbjerg, a little open northward of Gydehöj, bearing 248°, leads about 100 yards northward of the buoy marking its north extreme.

Having run about 600 yards past the buoy, steering this course, alter to 195°, which will lead between the bank extending westward of Hjelm and the 3-fathoms patches in Hjelm Deep, and when Ellemandsbjerg is in line with the low point of Hasenöre, 258°, it should be steered for.

Or a vessel may cross the bank northward of Hjelm, on this mark, with not less than 4¼ fathoms water.

When the west point of Hjelm bears about 170°, a 203° course should lead between Öreringene and Bjarkes Ground, or the buoy marking Klokke Ground might be rounded, and the channel between Gaasehage and Öre Flat be taken, but there are no leading marks for the latter.

When the west point of Hjelm is bearing 170° a vessel may steer to pass 200 yards westward of the west point of Hjelm and bring Jernhatten in line with it, bearing north, then steer south until Skjelhöj is open westward of Elsegaarde, 335°, when Bjarkes Ground will be passed, and a course may be shaped to the westward for Sletterhage. (Directions between Tunö and Samsö, see below.)

By night, if the lightbuoy on the south side of Mosel Ground is sighted, a vessel may steer to pass southward of it, and when it is passed, steer into the fixed white sector from Sletterhage Light, between the bearings of 286° and 293°, which will lead clear of danger to that point, excepting a 4½-fathoms patch close to the northern limit.

Ebeltoft Bay, at its head, is an almost circular bay, about 2¾ miles in extent, entered between Alhage on the east and Bognsholm on the west, which are 2¼ miles apart; the land at the head of the bay is low, but rises quickly to wooden ridges and hilly country inland.

Skjelhöj, on the eastern side of the bay, has been already described, and fronting it is the town of Ebeltoft, with its church spire and mills. About a mile from the head is Lyngsbæk Wood, and between it and the shore are the two white lighthouses from which

leading lights are shown, while on the west side is Dyrehöje, already mentioned; on Helgenæs are Helgenæs Church, painted white, and Vængesö, Helgenæs, and Esby Mills.

Lights.—Two leading lights are exhibited from square white structures at the head of Ebeltoft Bay; they are 630 yards apart, and in line bearing 357°. The rear lighthouse, 13 feet in height, exhibits, at an elevation of 104 feet above high water, a fixed white light, which is visible 16 miles.

The front lighthouse, 10 feet in height, exhibits, at an elevation of 37 feet above high water, a fixed light, with white and red sectors, which is visible 11 miles. (For sectors, see Light List.)

Dangers.—Sandhagen, which extends in a northwest direction for about 1 mile from Al Hook, is composed of white sand, with depths of from 1 to 3 feet over it, and owing to its bright color may generally be seen; it is steep-to, with 5½ to 6 fathoms close-to.

Buoys.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 6½ fathoms 400 yards northwest of the northwest extreme of Sandhagen.

The northeast end of Sandhagen is marked by a red spar buoy surmounted by an upturned broom; it is in 1¼ fathoms water.

Pilken is a large sand patch, with a depth of 3 fathoms over it which lies about 600 yards northward of the northeast end of Sandhagen, and eastward of the latter shoal water extends off the southeast side of the bay for a distance of about ¾ mile and is distant 1,200 yards from the shore westward of the north end of the town.

Buoys.—A white spar buoy, surmounted by a straw wisp, is moored in a depth of 1½ fathoms on the southwest side of the above shoal ground.

Pikkel Ground is a shoal of sand and stones lying nearly 1¼ miles northeastward of the north end of the town; it has a depth of 1¼ fathoms over it.

Egemark Ground, with ¾ fathom water over it, lies ½ mile north-northeast of Pikkel Ground.

Kolskjær Ground, with a depth of 1½ fathoms over it, is about 800 yards westward of Egemark Ground.

Ebeltoft Harbor consists of two small harbors or basins, of which the northern, about 200 yards in length and 150 yards in width, with an area of 6 acres, is formed by a north breakwater extending about 200 yards in a west-northwest direction and a south breakwater, which is nearly the same length, in a north-northeast direction; both breakwaters are built of stone.

About 100 yards southward of the above is a small harbor less than 70 yards in extent and an area of less than ¾ of an acre, with a breakwater 100 yards in length in a south-southwest direction, and a short arm extending westward toward it.

The railway runs on the quay, which separates the two harbors.

Lights.—From a white post, 10 feet in height, situated on a hill southward of the town, a fixed red light is exhibited at an elevation of 75 feet above high water.

On the western breakwater head of the southern harbor a fixed red light is exhibited from a similar post at an elevation of 21 feet above high water.

These lights are 428 yards apart, and in line bearing 107°.

Two fixed white leading lights are also shown from poles 25 and 6 feet in height, respectively, from a position about ½ mile southward of the town; they are 170 yards apart, in line bearing 124°, and exhibited at elevations of 27 and 8 feet, respectively, when steamers are expected from 1st September to 1st April.

A fixed green light is shown from the northeast corner of the southern harbor.

Entrance—Depths.—The entrance to the northern harbor, facing northwest, and about 40 yards wide, is approached by a dredged channel, 400 yards in length and 33 feet in breadth, with a depth of 3 fathoms, which depth is in all the western part of the harbor, but the eastern half has only a depth of about 1 foot.

The entrance to the small harbor, about 20 yards wide, has a depth of 2¼ fathoms and 2 fathoms in the center inside.

In the north harbor there is a depth of 18 feet alongside the quays on the west and south sides, and 12 feet alongside the quay in the south basin.

Northwesterly gales raise the water in the harbor 6¼ feet, and those from the eastward lower it 4 feet.

Warping buoys.—There are four warping buoys, two on each side of the dredged channel.

Pilots may be obtained, and take vessels to Jutland ports in the immediate neighborhood.

Directions.—Vessels entering Ebeltoft Bay may pass on either side of Skade Ground, or north of Öre Flat. The leading mark to pass eastward of Skade Ground, and westward of Sandhagen is a high tree in Lyngsbæk Wood in line with a small gray house on the beach, at the head of the bay, or the square light structures in line, bearing 357°; by opening these marks and keeping farther westward, deeper water may be obtained when passing Sandhagen.

Skjelhöj, in line with Bögebjerg, bearing about 36°, leads between Skade Ground and the shoal water extending off the east side of Helgenæs, and also leads southeast of the shoal 1½ miles eastward of the isthmus, before mentioned. Ellemandsbjerg, in line with Esby Mill, 228°, leads southeast of the same shoal.

Having passed westward of Sandhagen, bring the southern hill of Skjelhöj in line with the courthouse spire (not charted), bearing

about 93°, until nearly abreast the white spar buoy which marks the southwest side of the shoal ground off the south part of the town, when alter course for the entrance to the dredged channel, the marks for which are a white beacon with diamond-shaped top-mark at the southern end of the town, in line with the entrance to the north harbor, bearing about 152°.

By night.—The fixed white leading lights at the head of the bay in line, bearing 357°, lead between Öre Flat and Skade Ground, and in passing the latter the high light may be opened slightly to the eastward, but before Hjelm Light is closed in by the land of Hasenöre they should be brought in line again to lead westward of Sandhagen, and after passing that shoal the fixed red leading lights should be brought in line, bearing 107°, which will lead to the anchorage, the position of which may be known by the two white lights in the southeast corner being in line, 124°. (See Period of exhibition.)

Anchorage, with good holding ground, may be obtained over the whole of Ebeltoft Bay.

Town.—The town of Ebeltoft had a population of 1,656 in 1909.

Communication.—A regular service of steamers connects the port with Aarhus, Copenhagen, and Horsens, and a railway runs to Trustrup, a distance of 13 miles, where it joins the State railway between Aarhus and Grenaa.

There is a post and telegraph office in the town, also a telephone, which latter is connected with the harbor on days when steam vessels arrive.

Coal and supplies.—A small quantity of coal and fresh provisions are obtainable, and water can be procured close to the harbor.

Coast.—From Sletterhage to Stavns Öre, the coast has a steep declivity, but round Begtrup Bay to Molshoved it is flat, with some high ground behind. Helgenæs church and mill, Vistofte church and mill, and Tved, Blaakær, Dejgret, and Kvelstrup mills, are objects that may be recognized, also Löghöj and Isgaard, hills 258 and 152 feet high, immediately northward of Molshoved; the summit of Löghöj is conical and covered with dark-colored trees.

Begtrup Bay, northward of Stavns Ore, is about 1½ miles in extent, but shoal water, on which are rocks named Rönnen, extends nearly ⅓ mile from it north and nearly ⅓ mile from the south side; the space between these is about 1 mile in an east and west direction, and about 1,200 yards wide, with depths of 8 fathoms. The shore bank round the bay is about ⅓ mile in width, the bottom being sand and small stones.

Shoal.—A shoal about ½ mile in length in a northwest and opposite direction, with a depth of 3 fathoms over it, lies northwest

of Stavns Ore, and about 1 mile westward of the entrance to Begtrup Bay.

Clearing mark.—Dyrehöje Hill, its own breadth open westward of Vistofte mill, bearing 50°, leads northwestward of the shoal.

Directions.—Care is necessary in rounding Stavns Öre, as the shoal water extending northward of its is steep-to, and the water deepens suddenly to 11 fathoms from its edge; the beacons on Draget in line, or Risskov open south of Molshoved, bearing about 274°, lead northward of this shoal ground.

Anchorage.—Begtrup Bay affords good anchorage for small vessels with north and east winds, but west and especially southwest winds send in a considerable sea, when anchorage can be obtained eastward of Rönnen, in depths of from 2¾ to 3¾ fathoms, but it requires local knowledge to enter. In depths over 4 fathoms the holding ground is usually bad, owing to seaweed.

Piers.—Near Særbæk, on the north side of Begtrup Bay, is a pier for local steamers, with a depth of 2 fathoms alongside; and near Kongsgaard, on Helgenæs, there is one of wood, built up with stones, and 125 yards in length, with 6 feet water at its end.

Depths offshore.—From Begtrup Bay the 5-fathom contour line gradually draws offshore, and southward of Molshoved it is distant about 1,200 yards; off Kjelds Head it again nears the shore to about ½ mile.

Current.—A north-going current may sometimes set with considerable strength across the entrance to Begtrup Bay and on to Molshoved.

Coast.—From Kjelds Head to Skjödshoved, a distance of 2 miles, the coast is flat, the latter point presenting a square extreme, about 800 yards in length, to the westward, and with a steep slope to the sea. From Skjödshoved to Öhoved, a distance of 3¼ miles, the coast is also flat, and continues so around Kalö Bay, with some wooded highland in places in the background.

The most conspicuous objects in this stretch are Tved Church, without a tower; Knebel, Roelse, and Egnes churches, painted white, with sharp spires; a ruin at Kalö; and Ugelbölle Mill, which is on a high ground.

On the west side of Kalö Bay are the village churches of Skjödstrup, Hjortshöj, Egaa, and Vejlby, southward of which is Aarhus water tower (80 feet in height and 220 feet above high water), Risskov, and Aarhus town and churches. On the northwest side of the bay are the wooded slopes of Vosnæsgaard.

Depths offshore.—The 5-fathoms contour line from Kjelds Head curves around to the southward and westward, 1¾ miles to the southward of Skjödshoved, and then turns north, passing about 600 yards

westward of that point; inside it a tongue of shoal water extends for a distance of 1¼ miles, with depths of from 1½ to 2¼ fathoms over it. About 600 yards south-southwest of the extreme of the shoal tongue is a patch with 3 fathoms water over it, and about 1,200 yards northwest of this patch is an isolated shoal with a depth of 3¼ fathoms; the bottom on these shoals is a soft sand.

Kalö Bay, the entrance to which, between Skjödshoved and the western shore, is about 2 miles in width, extends in a northeast direction for a distance of 6½ miles, with a greatest breadth of 4 miles; Knebel Bay and Egens Bay are situated on its eastern side.

Depths.—The depths are from 6½ to 13 fathoms in the entrance, and from 5 to 9 fathoms inside.

Shoals.—The shoal water, which is about 400 yards westward of Skjödshoved, extends, with depths of from 1 foot to 3 fathoms, for nearly 1 mile northward of that point, and borders the shore, slightly increasing its distance from it, as far as Öhoved, there being a prong of shoal water with a depth of 2½ fathoms at its extreme, 1⅞ miles west-northwest of that point.

A detached patch, with a depth of 3 fathoms over it, lies immediately inside the 5-fathom contour line, and 1,600 yards northwest of Skjödshoved.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 4¾ fathoms westward of the 3-fathom patch.

Shoals.—Two detached shoals, with depths of 3 fathoms over them, are situated in mid-channel of Kalö Bay, and about 2 and 2¼ miles northeast of Skjödshoved.

Knebel Bay, entered on the northeast side of Öhoved, is a nearly circular basin about 1¼ miles in extent, the bottom of which is of soft clay, but seaweed is abundant and sometimes prevents the anchor from holding. There is a depth of about 4 fathoms in the entrance, which is 100 yards in width and from 4 to 9 fathoms inside.

Buoy.—The southeast end of Rön Sten is marked by a white spar moored in about 2 feet of water northeast of Öhoved and on the southwest side of the entrance channel.

Shoal.—Shoal water, with a detached patch of 2½ fathoms, extends for a distance of about 1,400 yards from the shore, northwestward of Vrinners mill, and nearly midway between Knebel Bay and Egens Bay.

Egens Bay, about 2½ miles northeast of Knebel Bay, is fronted by Rön Sten, rocky ground which lies across the entrance, leaving channels at each end of it.

Depths.—The depth in the southern entrance is 2¼ fathoms, and in the northern 4¾ fathoms, and inside there are from 2 to 3¼ fathoms, but a shoal, with a depth of 1 fathom, lies on the northern side of the southern entrance.

Buoy.—The southeast end of Rön Sten is marked by a white spar buoy, surmounted by a straw wisp, and also by a similar buoy with two wisps.

Ryes Flat (Vejlby Flat), on the western side of the entrance to Kalö Bay, is a nearly circular shoal, about 1,600 yards in diameter, with depths of from 2 to 3¼ fathoms over it, and in the center three small heads, on which the depth is 1½ fathoms.

On the west side of Kalö Bay the shoal water is generally about 600 yards off, but nearly midway between Egaa and Skjödstrup Churches it extends about 1,200 yards, with a depth of 1¾ fathoms.

Pilots may be obtained at Knebel Bay.

Directions.—The mark for leading between the shoal southwest of Skjödshoved and Ryes Flat is Ugelbölle Mill, at the head of the bay, in line with the highest part of Vosnægaard Wood, bearing about 23°, which will also lead westward of the patch, northwest of Skjödshoved, and, having passed it, a 40° course should lead up the bay. The flat northwest of Öhoved is passed when the high chimney northwest of Skjödstrup Mill is in line with that mill.

If intending to enter Knebel Bay, Skjödstrup Church in line with the northern side of the first cliff, near the beach, southward of Hav Wood, bearing about 293°, used as a stern mark, leads in a depth of 4 fathoms, northward of the shoal water extending from Skjödshoved and Öhoved, and when Tved Church is in line with the low point of Öhoved, about 171°, alter course for it until Skjödstrup Church is in line with a conspicuous notch in the above-mentioned cliff, about 296°, when with it as a stern mark head for Knebel Church to the anchorage.

If proceeding to Egens Bay, Bregnet Church in line with the only tree on Kalö, bearing about 31°, leads westward of the shoal ground extending northwestward of Vrinners Mill, and two posts, surmounted by white squares and situated on Nappedam Pier, when kept in line, lead to it southward of Rön Sten, but it would probably require a pilot.

Anchorages.—The holding ground, on sandy bottom, is good over the whole Kalö Bay, but especially in Lögten Bay, near Ugelbölle Head; southwest winds are the only ones that cause a sea.

The bottom in Knebel Bay is soft clay, but seaweed is abundant and sometimes prevents the anchor from holding; a vessel may anchor on the leading mark when steering for Knebel Church.

In strong winds the anchor may not hold well in Egens Bay on account of the soft bottom.

Piers.—At Knebel Bay there is a pier situated near Thorup storehouses, which is 560 feet in length, and has a depth of 2¾ fathoms at its head.

At Nappedam, on the north side of Egens Bay, is a pier about 400 feet in length, with a depth of 10 feet at its outer end, and at Lögten Bay is one about 300 feet in length in a east-northeast direction, with 2 feet at its head.

Communication.—The local steamer with mails calls at Knebel Bay and the post and telephone, which latter is connected with Aarhus, are at Mörke; the nearest telegraph is a Rönde, distant about 6 miles.

In Egens Bay there is a post and telephone, but the nearest telegraph is situated about 2 miles from the pier.

At Lögten there is railway communication, the station being about 2 miles distant from the pier.

Coal and supplies.—From 500 to 1,000 tons of coal are stored at Knebel Bay, and fresh provisions and water can be obtained in the neighborhood.

Aarhus Bay, the area between Helgenæs on the east and the mainland on the west, is about 8½ miles in breadth, and about 12 miles in length, between the entrance to Kalö Bay and Samsö; it is encumbered with several shoals, but has in other parts depths of from 7 to 10 fathoms. The town of Aarhus is situated on the northwest side, and farther south is Norsminde.

Dangers.—Mejl Flat, lying in the entrance to the bay, immediately westward of a line joining Sletterhage and Issehoved, is 2.6 miles in length, in a west-northwest and opposite direction, with a greatest breadth of nearly 1½ miles. The general depths on the shoal are from 1½ to 3 fathoms, but near the western end, which is known as Mejl Ground, is a narrow dry sandbank about 700 yards in length, and from 2 to 3 feet above water, except when covered in strong easterly gales.

The shoal is fairly steep on its east and west sides, but less so on the north, and a prong of the bank extends 2 miles southeast of the sandbank, with a shallow tongue, with general depths of 4½ fathoms over it, extending for about 2 miles farther, with 3¼ fathoms near its extremity.

Beacon.—About the center of the sandbank is a beacon, 26 feet in height, in the form of a truncated cone, painted red and white in checks, and surmounted by a red ball.

Shoals.—Nearly midway between Mejl Flat and Sletterhage is a shoal about 1 mile in length, in a northeast and opposite direction, with a least depth of 4 fathoms on its northeast end; it lies on a circular bank, 1¼ miles in diameter, within the 10-fathom contour line.

A shoal, with 3¾ fathoms water over it, lies 1¼ miles westward of Mejl Flat beacon.

Lille Ground, consisting of rocks, with a depth of ¾ fathom over it, is about 140 yards in length, in a northwest and opposite direction, and about 10 yards in width; it lies on a shoal, with depths of from 2 to 2¾ fathoms, which is ¾ mile in length in an east and west direction, and situated immediately eastward of Mejl Flat.

Buoy.—A conical red and white horizontally striped buoy, surmounted by a ball, is moored, in a depth of 4¾ fathoms, 400 yards eastward of the least depth on Lille Ground.

Clearing mark.—A notch in the hill, eastward of Lyngsbæk Wood, in line with the east side of Helgenæs, bearing about 7°, leads eastward of Lille Ground.

Wulffs Flat, about 1,600 yards in extent, within the 5-fathom contour line, and with a least depth of 3 fathoms, near its eastern side, lies 2¾ miles northwestward of Mejl Flat Beacon; two patches of 5½ and 5 fathoms, respectively, lie in a north-northwest direction from the shoal, the latter depth distant ½ mile.

Clearing marks.—Segalt Mill, situated on high ground 1 mile north-northeast of Skjödstrup Church, in line with the westernmost house of Skjödshoved, bearing about north, leads eastward in a depth of 4¾ fathoms.

Ellemandsbjerg, in line with the southern end of the first white cliff on the west coast of Helgenæs, bearing about 63°, leads south.

Current.—The current on the east coast of Jutland, in the vicinity of Aarhus Bay, usually sets to the northward, attaining its greatest velocity in that direction, but northwest gales, commencing suddenly, cause a strong southerly set.

The main stream of north-going current, following the east coast of Jutland as far as Aarhus, sweeps round the north side of Aarhus Bay toward Molshoved, and then turns to the southward along the east coast of Helgenæs, and running southward from Sletterhage, it unites off the northwest coast of Nordby with the branch of north-going current setting between Samsö and Tunö, the united streams setting with increased strength across the entrance to Ebeltoft Bay toward Hjelm Island.

The south-going current, setting to the westward across Ebeltoft Bay entrance, forms two streams, one of which runs to the southward along the west coast of Samsö, and the other between Sletterhage and Mejl Flat, gradually increasing in strength when westward of Sletterhage.

Aarhus Harbor, at the mouth of a rivulet, consists of a North Harbor, Gamle Harbor, and South Harbor. The outer breakwater which shelters North and Gamle Harbors is about 800 yards in length in a north by east direction and from the shore westward of it, two moles extend in a south-southeast and southeast direction, the first and outer, named the North Mole, being about 300 yards in length.

Between the North Mole and Middle Mole, the next southward, which is 200 yards in length, is a space about 200 yards in width known as North Harbor, having an area of 20 acres, and southward of Middle Mole is Gamle Harbor, with an area of 10 acres.

South Harbor is formed by a breakwater which extends in a direction parallel to the line of South Mole, and about 400 yards outside it, thus inclosing a large space; boat and petroleumn basins are situated northward of North Harbor.

North and Gamle Harbors afford perfect shelter, have 10,000 feet length of stone and wood quays, with depths of from 17 to 24 feet alongside, are lighted by electricity and connected with the railway; in North Harbor there is a grain elevator.

Lights—South Mole.—On the South Mole head a white iron tower, exhibits, at an elevation of 27 feet above high water, a fixed red light, which, in clear weather, should be visible from a distance of 6 miles.

From a white iron tower, with a red band, situated 200 yards within the South Mole head, a fixed red light is exhibited, at an elevation of 33 feet above high water.

A fixed green light, elevated 26 feet and visible 5 miles, is shown from a white tower with green band situated on outer end of West Mole.

Fog signal.—A siren at the South Mole head light tower gives three blasts every minute.

North Mole.—A white iron tower, 25 feet in height, with a green band, situated on the North Mole head, exhibits, at an elevation of 33 feet above high water, a fixed green light.

Middle Mole.—A fixed green light is exhibited, at an elevation of 39 feet above high water, from a brown post, 36 feet in height, on the Middle Mole.

A fixed green light is shown, at an elevation of 38 feet above high water, from the clock face of the pilot's house, southwestward of the harbor.

East Mole.—On the northern extremity of the East Mole, a white tower with red band, there is exhibited at a height of 33 feet above high water an occulting light with white, red, and green sectors. The white and red lights are visible 11 miles and the green 10 miles. For sectors see Light List.

Shoals.—A shoal, with a depth of 3 fathoms over it, lies about 1,200 yards northward of the South Mole head, and a patch, with a depth of 4½ fathoms, about 1¾ miles eastward of the same.

Lightbuoy.—A lightbuoy, showing a flashing green light every 3 seconds, is moored on the southern side of the 3-fathom shoal northward of the harbor.

Entrance—Depths.—The entrance to the harbor, facing north-northeast, between the South and North Moles, is 200 feet in width, and approached by a dredged channel, in which the depth is 26 feet, there being a depth of 24 feet between the moles; the entrance to Gamle Harbor is 130 feet in width. In North Harbor the depths are from 12 to 24 feet, and in Gamle Harbor from 17 to 22 feet; South Harbor will be dredged to a depth of about 27 feet.

Westerly winds raise the water in the harbor about 4 feet, and southeast winds lower it about 2½ feet.

Storm signals.—Storm signals are shown from a mast situated near the inner of the two light towers on the South Mole. (See Chapter I.)

Pilots may be obtained for the harbor.

Tug.—There is one tug, which during winter is used also as an ice breaker.

Directions.—The position of Aarhus may be known by its cathedral, with a very tall and heavy spire, and other churches, also by the water tower, already mentioned, to the northward, and Marselisborg Castle, which is a conspicuous, large, rectangular, white mansion to the southward of the town.

Approach the harbor with the entrance to North Harbor bearing about 282°.

The entrance to the harbor lies between the line of the two light-towers on the South Mole in line bearing 201°, and that of the tower on the North Mole in line with the light post on the Middle Mole, 203°, which lines meet at a distance of about 800 yards from the entrance.

By night, the harbor is entered by steering between the two fixed red lights in line on the port and the two fixed green lights in line on the starboard hand. Care must be taken to avoid the 3-fathom shoal northward of the entrance.

Tides.—It is high water, full and change, in Aarhus Harbor at 10h. 10m., the ordinary rise being about 2 feet.

Current.—Owing to the Aarhus River, at the head of the harbor, the current is generally running out.

Ice.—Average ice conditions, see Appendix.

Town.—Aarhus, a commercial town, and the next largest to Copenhagen, is prettily situated to the northward of Marselisborg Woods; it dates back to the tenth century, but, owing to fires, few of the quaint old houses remain; the cathedral, built in the thirteenth century, has a steeple 292 feet high. The crown prince of Denmark has a chateau near, and the population was 61,755 in 1911.

Harbor regulations.—Special harbor regulations are in force, a printed copy of which should be obtained from the port authorities.

Communication.—During the summer months steamers run daily to Copenhagen and three times weekly in winter; there is a daily steamer to Kallundborg; a weekly steamer to Hamburg; and fortnightly steamers to Leith, Newcastle, Bremen, and Rotterdam. A small steamer runs to Marselisborg Woods.

Aarhus is a junction of the East Jutland Railway and there is communication by rail with Grenaa, distant 41½ miles, also with other towns in the north, and to the south with Skanderborg and Fredericia. Telegraphic communication with all parts, the post and telegraph offices being near the harbor.

Coal and supplies.—About 5,000 tons of coal are kept in stock, and about 140,000 are imported annually; the coal wharf situated along the South Mole is 600 feet in length and has depths of from 22 to 24 feet alongside, and all together about 2,000 feet of the South Mole may be used for coaling purposes. Coaling is carried on by baskets, and from 300 to 400 tons could be put on board in 24 hours.

Fresh meat, bread, and vegetables may be procured, and water is laid on the quays, or it may be supplied to vessels from a motor tank boat.

Patent slip.—There is a patent slip, 80 feet in length, on blocks, depth forward 3 feet aft 10 feet. Lifting power, 150 tons.

Repairs.—Large repairs to machinery can be effected at a machine shop; there are cranes which will lift 10, 5, and 2 tons, the first in north and the two last in the Gamle Harbor. A traveling crane will lift 2½ tons.

Time signal.—A time signal is given daily at 1h. 0m. 0s., mid-European time, at the telegraph office. (See Chapter I.)

Trade.—The principal exports are foodstuffs, grain and flour, oils, minerals, and metalware, and imports, foodstuffs, grain and flour, salt, oil, metalware, minerals, phosphates.

Coast.—From Aarhus the coast trends in a southerly direction for a distance of about 7½ miles, to Norsminde, and for the first 6 miles it is steep and thickly wooded; at 4 miles south of Aarhus there is a projecting yellow cliff. The most conspicouous object are Skade mill, 340 feet high, southward of Marselisborg Wood, and near Norsminde, Flöjstrup Mill, a yellow storehouse, and Kalö Beacon.

Depth offshore.—For the first mile southward of Aarhus shoal water extends for a distance of ⅜ mile offshore, but afterwards it gradually closes the land, for about 4 miles and then extends off for about a mile from forms Hesbjger Ground with outlying shoals.

Norsminde, a natural harbor formed between Hesbjerg Ground on the north, and Kysing Hook on the south, from its entrance extends for a distance of about 1 mile, in a southwesterly direction; it is a valuable refuge for vessels meeting with easterly gales in Aarhus Bay, as it is well sheltered by the shoals surrounding it.

Beacon.—Kalö Beacon, situated about 1,200 yards west-southwest from the head of Norsminde Harbor, consists of a white pole, with supports, surmounted by a barrel.

Dangers.—**Hesbjerg Ground,** which commences to extend from the coast about 2 miles northward of Norsminde, stretches off at its central part, for about 1 mile, and has depths of from 1¼ to 2¼ fathoms over it; it is fairly steep-to on its eastern side. A patch of 2½ fathoms lies about ¼ mile northward of Hesbjerg Ground inside the 5-fathom contour line, which surrounds the whole shoal at a distance of about 1.1 miles from the shore.

Buoy.—A red conical buoy, surmounted by two upturned brooms, is moored in a depth of 2¼ fathoms, about 400 yards inside the eastern edge of Hesbjerg Ground.

Clearing mark.—A high, sharp-topped hill in line with the east side of Hjortshöj church tower, bearing about 354°, leads eastward of Hesbjerg Ground.

Kysing Hook, a sandy prong, extends from the south side in a northeast direction, for a distance of ¾ of a mile; two rocks with a depth of 6 feet over them are situated on Kysing Hook.

Norsminde Flat, which fronts the entrance to Norsminde, is 1.4 miles in length, in a north and south direction, with a greatest width of ½ mile; the depths on the shoal are from 1¼ to 2½ fathoms.

About 1,200 yards northward of Norsminde Flat is a shoal nearly 1½ miles in length, in an east and west direction, inside the 5-fathoms contour line, and with a least depth of 2¾ fathoms in its center; about 1,200 yards eastward of it is a detached patch with a depth of 3 fathoms.

Southward of Norsminde Flat are two patches, with 3 and 2¾ fathoms over them, respectively, the southern with the latter depth being distant from it about 1 mile, and midway between Norsminde Flat and Kysing Hook is a patch of 3 fathoms.

Buoys.—A conical red buoy, surmounted by an upturned broom, is moored, in a depth of 4 fatmoms, ½ mile northeastward of the depth of 1¼ fathoms at the south end of Norsminde Flat.

A white can buoy, surmounted by a down-turned broom, is moored in 3¼ fathoms water, westward of the depth of 1¼ fathoms.

Entrance—Depths.—Norsminde may be approached either from the north, between Hesbjerg Ground and Norsminde Flat, where the depths are not less than 3¾ fathoms, or from the south between Norsminde Flat and Keysing Hook, with not under 3¼ fathoms, which is the same depth as at anchorage. The harbor has a depth of two fathoms, but there is sometimes not more than 4 feet in the entrance.

Directions.—Approaching from the northward, Saxild Church, in line with the east side of Kysing mill, bearing 208°, leads eastward of the 2¾-fathoms shoal, northward of Norsminde Flat, and between Hesbjerg Ground and Norsminde Flat, and when Kalö Beacon is in line with the middle of the bridge across the entrance to Norsminde Harbor 232°, it may be steered for to the anchorage.

From the southward Dyret Hill, on Samsö, in line with the southwest side of Tunö, bearing 142°, leads between Norsminde Flat and Kysing Hook, and when Kalö Beacon is in line with the middle of the bridge proceed as before directed. The Roman Catholic Church at Aarhus, open its own height eastward of Abelshoved, 337°, also leads eastward of Kysing Hook in a depth of 4 fathoms.

Anchorage.—The anchorage at the head of the harbor is in a depth of 3¼ fathoms, with good holding ground.

Pier.—On the north side, near the head, is a pier 410 feet in length, with a depth of 10 feet at its head; but northerly winds raise and southerly winds lower the level 4 feet.

Communication.—The nearest post and telegraph offices are at Malling, distant 4 miles, and where is also the railway station.

Coast.—From Norsminde the coast trends in a south by west direction for a distance of 6¾ miles to Hov, and then bends to the southwestward for about 4¾ miles to Kols Nape. It is flat and here and there wooded. Kysing Mill, Saxild Church, and marine hotel, Bjergager Church, Dyngby village and mill, Randlev and Halling Churches are all conspicuous marks on the first stretch of this coast.

Depths offshore.—Between the point eastward of Norsminde, and a little southward of Kysing Mill, shoal water, with depths under 3 fathoms, extends offshore, in one place for a distance of ¾ mile, and off Dyngby Head about 2¾ miles southward of Kysing Mill, Dyngby Hook, with depths of 2 fathoms at 400 yards and 3 fathoms at 1,600 yards from the coast, extends in a northeast by north direction; southward of this to Hov, the shore bank is about 800 yards offshore.

The 5-fathom contour line, which is nearly 1½ miles eastward of Kysing Mill, gradually closes the land toward Dyngby Head.

Tunö, an island about 2 miles in length, in a west-northwest and opposite direction, and nearly a mile in greatest breadth, lies 4¾ miles eastward of Dyngby Head; the village, church, and a mill are situated on its southeast side, and the population of the island is about 250.

Light.—From the white church tower, 59 feet in height, situated near the southeast side of Tunö, a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 102 feet above high water. The white light is visible 15, the red 11, and the green 9 miles. (For sectors, see Light List.)

Dangers.—The island is surrounded by shoal water, which from the north, northeast, and south sides extends about 1,000 yards and about 100 yards from the west and southwest sides; on the southeast the shoal water does not extend more than from 200 to 400 yards. Möllekjær Ground, with a depth of ¾ fathom, extends about 600 yards southeast from the south point.

About 1¼ miles northward of the east point is a detached shoal about 1,200 yards in length and 800 yards in breadth, with a depth of 2½ fathoms. Tunö Rön, a narrow sand spit, nearly dry, extends about ½ mile from the east point of the island.

A patch, with a depth of 3¼ fathoms, is situated 1¼ miles 15° from Stenkarlen Beacon.

Light.—On the outer end of Tunö Rön is a red beacon, 16 feet in height, with a large red lantern, which exhibits, at an elevation of 13 feet above high water, an occulting white light. (For visibility, see Light List.)

The light, which is unwatched, is shown from a red support, on four sides of which the number 500 is painted in white, signifying that no stones, clay, sand, gravel, or similar matter may be removed from the bottom, surrounding the beacon to a distance of 500 alen, or 343 yards.

Beacon.—Stenkarlen Beacon, on the west point of Tunö, is a red pole, 26 feet in height, surmounted by a ball.

Tunö Harbor, on the southeast side, consists of two breakwaters, each about 525 feet in length, first in an east-by-south direction, and then curving toward each other at their heads, leaving an entrance between, facing eastward, 100 feet in width.

The depth in the entrance is 1¾ fathoms, and in the harbor about 1½ fathoms, but northwest winds raise the water 3 feet, and southeast winds lower it by about the same amount.

Light.—On the south breakwater head, a white lamppost, 7 feet in height, exhibits at an elevation of 12 feet above high water, a fixed red light, which is shown when vessels are expected.

Anchorages.—Off the southeast side of the island anchorage with good shelter from northerly winds may be obtained in depths of from 3 to 5 fathoms, with good holding ground, but in a less depth the bottom is foul.

Along the southwest side good holding ground will be found, except abreast Stenkarlen Beacon, in depths of from 2½ to 4 fathoms, but outside 6 fathoms the depths increase suddenly. The best anchorage on the north side is in a depth of 3 fathoms, with the church in line with the middle of the southeastern cliff, bearing about 174° and Asmör Hook, a little open southward of Tunö Rön Beacon, 120°, sheltered from southeast winds: near the northwestern cliff are several rocks, which must be avoided.

Communication.—The post, telegraph, and telephone offices are in the village, about a cable from the harbor.

Supplies.—Fresh provisions and water can be procured.

Submarine telegraph cable.—A cable connects Tunö with Samsö.

Kirke Ground, about 1¾ miles southwest of Tunö Church, is about 800 yards in extent, with a depth of 1½ fathoms over it.

About ¾ mile eastward and northwestward of Kirke Ground are patches of 3½ and 3¼ fathoms, respectively.

Tunö Knob, a sandbank about 1¼ miles in length, in a west-northwest and opposite direction, lies on a triangular-shaped bank of sand and weed, the apex of which is to the south-southwestward, and sides about 1¾ miles in length; it is 1 mile westward of Tunö, the channel between the banks on which they stand being about ¼ miles in width.

Buoys.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 3¼ fathoms, on the northeast edge of Tunö Knob.

A can buoy, surmounted by a down-turned broom, is moored in 3½ fathoms water, at the west end of Tunö Knob.

Targets for gunnery practice stand in the bank, four being on the north and two on the south side.

Aschehougs Flat, between Tunö Knob and Dyngby Hook, occupies a space of about 1¾ miles, in a north and south direction, and consists of two shoals, the northern, with a depth of 1¾ fathoms, and the southern, with 2¼ fathoms least water; the southern shoal is nearly 1¼ miles in length, in an east and west direction.

Pilots for all places in the vicinity, both southward and westward, or along the coast to the northward, may be obtained at Tunö; if required for other parts an agreement should be made.

Directions.—Large vessels use the channel eastward of Tunö, and small craft and coasting vessels that westward of that island. Ellemandsbjerg, kept between Tunö Rön Beacon and the easternmost house on Tunö, bearing about 10°, leads in deep water, eastward of Möllekjaer Ground, and Besser Church its own breadth northward of Bögebjerg, 123°, leads northeastward of Kirke Ground.

To pass northwestward of Kirke Ground, Ellemandsbjerg should be kept open west of Stenkarlen, bearing 23°, and to pass southeastward of the same shoal the northwest end of Samsö should be kept in line with Tunö Rön Lightbeacon, 47°.

The mark to lead between Dyngby Hook and Aschehougs Flat, in a depth of 4 fathoms, is Gylling Tree (solitary and standing on the end of Kols Nape) in line with the Hov Storehouse, bearing 204°, which also leads to the entrance of the narrow channel, westward of Hov Rön.

Northward of Tunö no useful marks can be given, but a vessel from the northward, having passed between Tunö and Tunö Knob by keeping Asmör Hook, well open south of Tunö South Point, bearing about 93°, as a stern mark, will have nothing less than 2½ fathoms.

Hov Harbor, about 2¾ miles southward of Dyngby Head, and immediately southward of the point of land where the coast changes its direction, is formed by two breakwaters, the eastern of which is 360 feet in length, in a southeast by south direction, with a bend, 160 feet in height, to the southwestward to its head.

The western breakwater is 575 feet in length, and almost parallel to the eastern, with a slight bend at its head to the southeastward, a short arm extends from the eastern breakwater in a southwest by west direction, dividing the harbor into two, the total width of the harbor being about 85 yards.

Light.—On the outer angle of the North Mole a gray iron tower, 16 feet in height, exhibits, at an elevation of 16 feet above high water, a fixed light, with white, red, and green sectors, which are visible, respectively, 9, 6, and 5 miles. (For bearings of sectors, see Light List.)

Entrance—Depths.—The entrance to the harbor, facing south, is about 70 feet in width, with a depth of 1¾ fathoms, the outer part of the harbor having the same, but the inner part is mostly shallow. The harbor is approached by a dredged channel 120 feet in width with a depth of 1¾ fathoms. Northwest and northeast winds raise the water 2 feet, and those from southeast to southwest lower it the same.

Hov Rön is situated on the western side of an irregular-shaped shoal, about 2½ miles in length, and the same in breadth, within the 3-fathom contour line, which fronts the shore at Hov, and is separated from the shore flats by a narrow channel; this shoal, being of sand, the water over it shows somewhat white. How Rön, consisting of rocks and seaweed, with from 1 to 2 feet water over it, is nearly 1½ miles long, in a north and south direction, and ¾ mile wide.

On the east side of Hov Rön are two detached patches of 2½ and 2¾ fathoms, the latter distant 4 miles east by south of Hov; a patch of 3 fathoms lies about 1,200 yards eastward of the northeast end of the shoal.

Hov Channel, the channel westward of Hov Rön, which shoal is steep-to on its west side, has a least depth of 1½ fathoms.

Buoys.—The shoal surrounding Hov Rön is marked by two buoys. On the eastern side a conical red buoy, surmounted by three up-turned brooms, is moored in a depth of 2½ fathoms. On the north side a white can buoy, surmounted by two down-turned brooms, is moored in 3½ fathoms water.

Hov Channel is marked by four spar buoys.

The channel to Hov Harbor is marked on the north side by three perches of boughs of trees.

Directions.—Hov Channel is not navigable for vessels drawing more than 10 feet water. From the north the leading mark already given is Gylling solitary tree on Kols Nape in line with Hov Storehouse bearing 204°, which leads to the entrance of the channel, and when Kysing Mill is in line with Dyngby Head bearing 356° alter course to 176°, with it as a stern mark, which leads through the channel, keeping between the buoys.

Submarine telegraph cable.—A telegraph cable crosses from a position 1,800 yards northward of Hov to the western part of Sæl Bay, in Samsö, and vessels should not anchor in its vicinity.

Beacons.—The shore ends are marked by telegraph beacons. See Chapter I.

Communication.—There is railway communication with Aarhus, the railway station being near the harbor, as also are the post, telegraph, and telephone offices.

Coal and supplies.—Some coal might be obtained and fresh provisions; water can be procured from the waterworks.

Coast.—From Hov to Kols Nape, a distance of nearly 5 miles, the coast is low; Gylling Tree on Kols Nape has been already mentioned as conspicuous.

Söby Reef, extending nearly 1½ miles from the coast, about midway between Hov and Kols Nape, has depths of from 1 foot to 2 feet, and several rocks on it show above water.

Sö Ground, a narrow ridge about 5 miles in length, in a southeast direction within the 2-fathoms contour line, extends from the shore immediately southwestward of Söby Reef, and from Kols Nape a shoal tongue with depths under 2 fathoms extends about 1¼ miles.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored, in a depth of 2 fathoms, near the southeast end of Sö Ground.

Svane Ground, separated from Sö Ground by a small channel with depths of from 2 to 2½ fathoms, is, within the 3-fathom contour line, 5¼ miles in length, in an east by south and opposite direction, and 2¾ miles in width. The shoalest part toward the western end is about 1½ miles in extent, and parts dry, especially with northerly winds; the bottom is generally sandy, but in places there are stone heaps.

Buoys.—A white can buoy, surmounted by a down-turned broom, is moored, in a depth of 4¼ fathoms, at the extreme of a prong of the shoal extending in a northerly direction.

A white can buoy, surmounted by two down-turned brooms, is moored in 2¼ fathoms water on the western edge of the ground.

A conical red buoy, surmounted by an upturned broom, is moored in 2¼ fathoms water, to the eastward of a 1¾-fathom patch at the east end of Svane Ground.

Clearing mark.—The eastern side of Helgenæs shut in by Kelsor Hook, the latter bearing 4° by day, and the white sector of Tunö Light by night, leads eastward of Svane Ground.

Endelave, lying south-southwest of Svane Ground and separated from it by a small channel having a depth of 1¾ fathoms, is an island in the form of a right-angled triangle, the sides of which are about 2½ miles in length; a bay is formed in the side that faces northwest, the church and some houses being on its western side. The population of the island numbers about 675.

Pier.—From the north side of the island, immediately eastward of the church, a pier extends in a northerly direction for a distance of 1,300 feet, and at its head is a small boat harbor, 132 feet long, in a north and south direction, and 82 feet wide, with an entrance open to the northeast 30 feet broad.

Lights.—At about 400 yards from the church two fixed red lights are exhibited from white beacons, at elevations of 52 and 23 feet above high water, respectively; they are leading lights shown from September 1 to March 31, when the mail steamer is expected, and are in line bearing 164° 165 yards apart.

On the head of the eastern of the two small moles at the pier end a fixed red light is exhibited from a lamp-post, 16 feet in height, between August 1 and April 1.

When the steamer is expected a fixed green light is shown from the western mole head.

The fixed red lights from the beacons, which are situated 200 yards from the red light on the East Mole, when in line with it, bearing 151°, form leading lights.

Dangers—Over Ground.—From Överste Point, the north point of the island, a sandy spit, 1 mile wide at its southern part, tapers gradually to a point, in a northerly direction for a distance of 1¾ miles, and has a general depth of ½ fathom over it; the extreme of this shoal is about 1,200 yards from the edge of Svane Ground.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 4 fathoms, about 400 yards northward of Over Ground.

Depths offshore.—The 5-fathoms contour line is distant about 1¾ miles from the east side of the island, and that of 3 fathoms about 1,200 yards, but off the south coast the latter is more than 1 mile, and

fairly steep, as the 10-fathom contour line passes only 600 yards southward of that of 3 fathoms.

Klob Hook, a shoal with depths of from 1 fathom to 3 fathoms, and about 1 mile in width, extends for a distance of 2¼ miles from Kloben, the west point of the island.

Mölle Ground.—Shoal water, with depths under 3 fathoms, occupies a space about 3½ miles square, on the northern side of the island, and on this Mölle Ground and other shoals, the first a triangular-shaped shoal, the sides of which are about 1 mile, lies about that distance north-northwest of Kloben, and dries in places.

Mölle Hook extends from the shore for about 800 yards toward Mölle Ground, and northward of the latter shoal are Knösen and Möllevingen, 1-fathom patches, and 1 mile west-northwest of the latter is a shoal with a depth of 1¾ fathoms over it.

Buoys.—The west side of Mölle Ground is marked by a white can buoy, surmounted by two down-turned brooms; it is in 3 fathoms water.

A white can buoy, surmounted by one down-turned broom, is moored in a depth of 2¾ fathoms northwest of the 1¾-fathom shoal, west-northwest of Möllevingen.

Depths.—The depths at the anchorage off Endelave are from 2 to 3 fathoms, and in the boat harbor the depth is 8 feet.

Telegraph cable.—A telegraph cable crosses from Kloben, the west point of Endelave, to the southeast side of Hjarnö, and vessels should avoid anchoring near it; the shore end on Endelave is indicated by triangles placed on the nearest telegraph poles.

Directions.—If proceeding through the channel between Svane Ground and Endelave keep Dyngby Mill open eastward of Hov storehouse, bearing 340°, and steer 160°, with it as a stern mark, or if this mark can not be seen, a house with a spire to the northward of Hov kept between Hov storehouse and Hov houses will be on about the same bearing.

When Sö ground is passed, the mill should be opened 3 or 4 times its height eastward of the storehouse to avoid the shoals extending from Endelave, and when Alrö Church is in line with the south side of Gyllingnæs, bearing 286°, steer 106°, with it as a stern mark, which will lead southward of Evane Ground.

Alrö Church is not easily made out, but the trees surrounding it will point out its position.

Assens Church just open north of Ashoved Wood, bearing 281° leads southward of the shoal water extending southward of Endelave, in not less than 3 fathoms.

Anchorage.—The best anchorage at Endeleve is northward of the village, in a depth of 2 fathoms, with a mill to the southward

in line with the first house eastward of the church and Dyret, on Samsö, in line with Överste Point, the north end of Endelave, 70°. This anchorage is sheltered by Mölle Ground, but north and northeast winds raise some sea.

Communication.—There is a daily post to Horsens, and a telephone on the island.

Supplies.—Fresh provisions and water can be obtained.

Gunnery practice is carried out occasionally in the vicinity of Svane Ground, in an area bounded as follows:

The northern limit is an imaginary line in an east and west direction through the white can buoy (down-turned broom) on the north-northwest end of the shoal, and the southern limit a similar line through the north point of Endelave; the western limit is from this point to the same buoy, and the east a line north and south, through the conical red buoy (upturned broom) marking the east end of Svan Ground.

When firing is in progress by night the area is lighted by electric searchlights, and under such circumstances no vessel should enter the illuminated locality.

Horsens Fiord, from its entrance between Kols Nape on the east, and Hunds Hook on the west, which are nearly 5 miles apart, extends in a west by north direction for a distance of 10 miles to Horsens; Hjarnö lies northeast of Hunds Hook, on the south side, and Alrö, within the northern side, and northward of Hjarnö, both islands being surrounded by shoal water, except on the southwest, where the entrance channel lies. There are wooded hills on both sides of the fiord, and Hjarnö and Alrö are low and partly wooded.

The conspicuous objects on the north side are Hundslund, Sövind, and Gangsted Churches, Hjarnö Church and mill, a large storehouse at Snaptun. Alrö Church and mill, and Boller Mansion House, with Uth Church, on the south side of the fiord.

Lights.—Leading lights, 789 yards apart, and in line bearing 340°, are shown from the west side of Hjarnö.

The rear light, on the northwest point of the island, is fixed white and exhibited at an elevation of 59 feet above high water, from a red beacon 49 feet in height; it is visible 13 miles.

The front light, also fixed white, is exhibited, at an elevation of 16 feet above high water, from a white house 16 feet in height, and is visible 9 miles.

The following leading lights are also shown for the navigation of the fiord:

Haldrup.—Near Haldrup village, on the north side of the fiord, and about 5 miles northwest of Hjarnö, are two leading lights, 656 yards apart and in line, bearing 321°, which are visible over an arc of

4° on either side of this line. The rear light is fixed white and exhibited, at an elevation of 52 feet above high water, from a white house 20 feet in height; it is visible 12 miles.

The front light, occulting white, is exhibited, at an elevation of 16 feet above high water, from a white house 16 feet in height, and is visible 9 miles.

Seit.—On the south side of the fiord, near Christiansminde, two leading lights are 450 yards apart and in line, bearing 238°; they are seen over an arc of 10° on either side of this line.

The rear light, shown from a white house 16 feet in height, is fixed green and exhibited at an elevation of 33 feet above high water; it is visible 8 miles.

The front light, fixed green, is exhibited, at an elevation of 10 feet, from a white house 10 feet in height, and should be seen from a similar distance as the rear light.

Horsens.—Two fixed red leading lights are exhibited at Horsens Harbor, the rear, at an elevation of 62 feet above high water, from a brown mast 62 feet in height, surmounted by a triangle, apex pointing downward; the front light is shown from a white building, at an elevation of 16 feet above high water, and the lights are visible 12 and 9 miles, respectively.

The lights are 750 yards apart, and in line, bearing 284°, lead through the dredged channel, but they are not lighted when ice obstructs the fiord.

Dangers.—The 3-fathom contour line, which is about 1½ miles southeastward of Kols Nape, has a general easterly direction, for about 5¼ miles, to ¾ mile southward of Hjarnö, passing 1¾ miles southward of Gyllingnæs.

Skomager Ground, a shoal about 1¼ miles in length in a northwest and opposite direction, and about 800 yards in width, has depths of 1¼ fathoms over it, and lies inside the 3-fathom contour line, about 1 mile south-southwest of Gyllingnæs.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 3½ fathoms, on the southeast of the shoal.

Sönder Ground, a small shoal, steep-to, with a depth of 2½ fathoms over it, lies 1 mile southward of Hjarnö, and separated from the shore bank extending south from that island by a channel with a depth of 3¼ fathoms.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored, in a depth of 4½ fathoms, southwest of the shoal.

Entrance—Depths.—The entrance to Horsens Fiord, between the points of shoals extending south-southeast of Hjarnö and eastward of Hunds Hook, is about 400 yards in width. The channel has a northwesterly direction, for a distance of nearly 4 miles, between the

shoal water on either side, and then rounds Sæl Ground, a shoal extending northward of Borre, and turns to the southwestward for about 1¼ miles to the entrance to the dredged channel, which latter is 4 miles in length, with a breadth of 105 feet.

The depths at the entrance westward of Sönder Ground are from 7 to 9 fathoms, and from 8 to 11 fathoms to the entrance to the dredged channel, which latter has a depth of 3 fathoms.[1]

Buoys.—Sönder Ground, the outer buoyed danger on the eastern side of the channel, has been already mentioned.

Alrö Hook, which extends about 800 yards west-northwest of Jæge Head, the southwest point of Alrö, is marked on its western edge by a spar buoy, painted red, in a depth of 2 fathoms.

Hunds Hook, the shoal water from which is the outer danger on the western side, is marked by a white can buoy, surmounted by two down-turned brooms.

Sæl Ground, the shoal which extends northward of Borre, is marked by three buoys, named, respectively, Borre Knob East, Borre Knob North, and Borre Knob West; they are white spar buoys, surmounted by straw wisps, and moored in 1 fathom and 3½ fathoms, respectively.

Four green conical buoys on the northern side of the fiord on the bank situated between the two reaches of the channel mark the southern side of a spoil ground.

Horsens Harbor, about 600 yards in length and 250 yards in width, is at the mouth of a rivulet and fronts the town. Nyhavn, the outer part, is about 200 yards square, and at its head is Gamle Harbor, which extends about 350 yards in a northwest direction, with a width of about 50 yards. There are depths of 20 feet alongside the quays.

Beacon.—Close to the front light is a white beacon or daymark, surmounted by a triangle with the apex pointing upward.

Dredged channel buoys.—The north side, or starboard hand, of the dredged channel only is buoyed.

The north side of the entrance is marked by a conical red buoy, surmounted by two up-turned brooms, which is followed on that side by seven red spar buoys, each surmounted by an up-turned broom.

A red barrel buoy, surmounted by an up-turned broom, is moored nearly 2 miles eastward of the harbor on the north side and is followed by 15 spar buoys similarly painted and surmounted.

Ice breaker.—A local steam vessel, constructed to act as an ice-breaker, is used when necessary to keep the channels clear.

Pilots may be obtained from Hjarnö, or from the town of Horsens, and pilot vessels to the northward as far as Aarhus, to the southward

[1] It is reported that the depth of the channel and in the harbor is to be increased to 22 feet.

as far as Fredericia, and to the eastward to Odense Fiord. Pilotage is compulsory in the dredged channel for vessels over 80 tons register.

Tug.—A steam tug is available.

Directions.—Vessels from the eastward must pass southward of Skomager Ground and Sönder Ground, the mark for leading southward of the latter being Jensgaard Mill open southward of Neder Wood, bearing 282°, and when Gangsted Church is in line with Hjarnö Mill, or the lighthouses on Hjarnö are in line, bearing 339°, they may be steered for until Vaarsö Calf is a little open east of Borre Knob, 318°, which leads up the channel until nearing Snaptun, where there is a small pier, and the vessel should be kept somewhat to the eastward of the mark to avoid shoal water eastward and northward of Snaptun. If Haldrup white lighthouses can be distinguished, they should be in line, bearing 320°, and the eastern side of Stensballe Wood in line with the middle of Vaarsö Calf, bearing 314°, leads eastward of the shoal ground northward of Borre Knob and of Sæl Ground.

When passing northward of Sæl Ground, Horsens Church should be nearly open of the land on the north side of the fiord 273°, and if the white lighthouses near Seit can be distinguished they may be brought in line, bearing 237°, which will lead to the entrance of the dredged channel.

Sövind Church in line with the west side of Vaarsö, bearing 11°, as a stern mark also leads to the entrance, but with only a depth of 2½ fathoms. The beacons in line, 283°, lead through the dredged channel, but unless under the tonnage given vessels must take a pilot.

By night.—Hjarnö fixed white lights, bearing 339°, lead into the channel until Haldrup fixed red lights are in line, 320°, which lead to the northward of Sæl Ground, when the fixed green lights near Seit should be brought in line, 238°, which leads to the entrance of the dredged channel, and the fixed red lights at Horsens, in line, 284°, lead through it.

Small vessels drawing not more than 8 feet water may enter the fiord between Hjarnö and Alrö.

For directions when approaching from the southward see below.

Piers.—There are piers at the following places near the entrance, and in the channels to Horsens:

On the southeast side of Gyllingnæs, 410 feet in length, with a depth of 3 feet at its outer end.

On the southwest side of Hjarnö, 300 yards in length, with from 1 fathom to 1¼ fathoms alongside.

At Jæge Head, the southwest point of Alrö, with 1½ fathoms, and at Amstrup, on the north side of the same island, but here the water is shallow.

At Snaptun, on the west side of the entrance channel, with a depth of 12 feet at its end. Northwest gales raise, and those from the southeast lower, the level 4 feet.

Abreast Boller Mansion House, on the south side of the dredged channel, 750 feet being composed of earth and 150 feet of woodwork, with a depth of 5 feet at its outer end.

Submarine telegraph cables.—A telegraph cable connects Hjarnö with the west end of Endelave, the marks for the shore end of which on that island having already been given.

On the west side of Hjarnö, near the front lighthouse, is the end of a cable connecting the island with Snaptun, which is marked by a triangle on a telegraph post. Vessels should avoid anchoring in the vicinity of these cables.

Tides.—It is high water in Hjarnö Sound and on the coast in the vicinity at about 0h. 0m.; there is a regular ebb and flow of the tide at Horsens Harbor. In this entrance and at Hjarnö Sound the tidal stream, or current sometimes sets strongly.

Ice.—Average ice conditions, see Appendix.

Town.—Horsens is an old town, with a trade in cattle and agricultural produce; the population was 23,843 in 1911.

Communication.—There is railway communication with Aarhus and Fredericia, the railway skirting the head of the fiord; the railway station is about a mile from the harbor, as are also the post and telegraph. There is telephonic communication.

Supplies.—Fresh provisions can be procured, and water from the town waterworks is brought to the quays.

Repairs.—A machine shop might effect some repairs, and a crane will lift 5 tons. There is a patent slip with lifting power of 50 tons.

Time signal.—A time signal is given daily at 1h. 0m. 0s., mid-European time, at the telegraph office. (See Chapter I.)

Trade.—The exports are agricultural produce, and imports feeding stuffs and coal. The manufactures are soap, dairy machinery, beer, cement, lime, cloth, driving belts, sails, sailcloth, staves, and butter casks.

Coast.—From Hunds Hook the coast has a southwest direction for 3 miles, and then turns to the eastward to As Head, forming As Bay, and between As Head and Björnsknude, a distance of 3½ miles, another bay, named Sandbjerg, is formed.

Jensgaard and Klejis mills and Assens white church are conspicuous on this part of the coast.

Dangers.—A shoal, with a depth of 2¾ fathoms over it, is situated about ½ mile off the shore of As Bay and 1¾ miles southward of Hunds Hook.

As Head Flat, a broad shoal, extends in a southeast direction from As Head, having, at about 600 yards from the point, depths of from 1 foot to 6 feet over it.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 4 fathoms eastward of As Head Flat.

Sandbjerg Bay.—From As Head the coast has a west-southwest direction for about 3 miles, to the head of Sandbjerg Bay, and on the north side, within As Head, is Palsgaard House; from its head the coast trends southeast for 2 miles to Björnsknude.

A tile-works chimney and a coast hospital near Juelsminde are conspicuous on the south side of Sandbjerg Bay. On the north side of the bay shoal water extends about 1,200 yards off Böge Head and the shore bank is generally about a quarter of a mile off.

Juelsminde.—On the south side of Sandbjerg Bay is Juelsminde Harbor, formed by a breakwater extending about 250 feet in a north-northeast, and then turning 330 feet in a northwest direction, the area inclosed being about 100 yards in length and 70 yards in width; the railway runs on the breakwater.

There is a depth of 13 feet in the harbor and only 8 feet at about 20 yards from the breakwater head, and all the southwest side of the harbor is shallow. The harbor is very liable to silt.

Light.—A fixed red light is exhibited from the breakwater end from August 1 to April 30.

Communication.—A railway runs to Horsens, a distance of 19 miles, and there is a post and a telegraph office. A ferry connects it with Bogense, a town in Fyen.

Anchorage.—Sandbjerg Bay affords excellent anchorage with winds from north, through west, to south, the best berth being in a depth of 4½ fathoms abreast Juelsminde.

Björnsknude is densely wooded, and terminates in a low sandy cliff.

Björnsknude Reef.—Between Juelsminde and Björnsknude an extensive shoal, with depths of from 1¼ to 2½ fathoms, extends 1.4 miles eastward, with a prong, on which the depths are less than 3 fathoms, stretching in a southeast direction for 1½ miles from Björnsknude. For a distance of 600 yards from that point the shoal is rocky, with from 1 foot to 2 feet water over it.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 3¼ fathoms southeastward of Björnsknude Reef.

Middle Flat.—In the southern approach to Horsens Fiord, between As Head and Klob Hook, are two shoals, of which Middle Flat, the northern, is about 1,200 yards in length in an east and west direction, with a depth of 2¼ fathoms over it. It lies 2 miles eastward of As Head.

Lille Ground, the southern shoal, is about ¾ mile in length in a north and south direction, within the 5-fathoms contour line, and has a depth of 2¾ fathoms in the center. Both shoals are composed of sand and stones.

Buoy.—A white can buoy, surmounted by three downturned brooms, is moored, in a depth of 4½ fathoms, westward of the shoal.

Directions.—Approaching Horsens Fiord from the southward, Hjarno Church midway between Hundslund and Gangsted Churches, bearing 344°, by day, or Hjarnö Light in line, 339°, by night, lead between Lille Ground and As Head, and to the entrance.

Samsö, the north point of which is 6 miles southward of Helgenæs, is 14¼ miles in length in a north and south direction, and 4 miles greatest width, but near its center, between Samsö Bay on the west and Stavns Fiord on the east side, it is only about ⅓ mile in width. The population is about 7,500.

Isse Head, the northern point of Nordby Land, which is the name given to the northern part of the island, is low, but southward of it the west coast of this part of the island is hilly, whilst southward of Samsö Bay the west coast consists of alternate bluffs and low places; Dyret, a conspicuous dome-shaped hill 161 feet high, is situated about 1¼ miles inland and the same distance southward of Samsö Bay.

The most conspicuous objects on the west coast are Onsbjerg church and mill, Tranebjerg church, Tandrup Mill, Möllebakke Mill, isolated and standing on a hill 141 feet high, Kolby church and mill, and Kolby Kaas, with its houses and mill.

The southern part of the island is low, with two yellow cliffs in the middle, the most conspicuous objects being Vestborg and Ljus Hook Lighthouses and Brattingsborg house and wood.

The east coast is generally low, but higher northward of Nordby, its coast line is broken by Stavns Fiord, about 2 miles in extent; inclosed by Besser Reef, a narrow spit.

The conspicuous objects on this coast are Brunby and Kolhöj mills, westward of Ballen loading place, Besser church and mill, Mejlesholm, Havnehage, and Arme Head beacons, and Hönsepol, a remarkable hill on the west side of Besser Reef. In Nordby Land Nordby church and mill are conspicuous.

Isse Head Reef.—Isse Head Reef, a part of which dries, is a tongue stretching about 600 yards in a north-northeast direction from Isse Head, and is 800 yards in breadth at its inner part; surrounding it is Isse Head Flat, a square-shaped shoal, about 2 miles in breadth, with general depths of from 1½ to 2¼ fathoms over it, and extending 1¾ miles in a north-northeast and 2¼ miles in a northeast direction from Isse Head; the northeast part of the flat is named Klepperne.

A 1-fathom patch lies about 600 yards inside the north end of Isse Head Flat, and the western side of the flat is fairly steep-to,

but the 5-fathom contour line is 3¾ miles north-northeastward of Isse Head, with a patch of 3¾ fathoms about 3¼ miles from it in that direction.

Buoys.—A white spar buoy, surmounted by a straw wisp, is moored in a depth of 1¾ fathoms, at the north end of Isse Head Reef.

The northwest extreme of Isse Head Flat is marked by a white can buoy, surmounted by a down-turned broom, in a depth of 2½ fathoms.

Klepperne is marked by a white can buoy, surmounted by two down-turned brooms, in a depth of 4¼ fathoms.

Submarine telegraph cable.—A cable connects Isse Head with Sletter Hook.

West coast.—From Isse Head the west coast trends in a southwest direction for 2 miles to Kolsör Hook, and then turns south for 2½ miles to Asmör Hook, the north point of Samsö Bay, and has some hills from 138 to 210 feet high near it.

Samsö Bay is about 4¾ miles across the entrance, and recedes about 2¼ miles. Maarup Bight, on the north side, has a harbor, and Sæl Bight, on the south side, a pier.

Depths offshore.—From westward of Isse Head to Kolsör Hook the 5-fathom contour line is about 600 yards off, the shore bank extending about half that distance; from the latter point to Asmör Hook it nears the coast somewhat.

For 2 miles of the north side of Samsö Bay the shore bank extends about ½ mile, and the 5-fathom contour line is double that distance; with the exception of about 1 mile on the east side of the bay, where the shoal water is not more than 400 yards off, these conditions continue around to Sæl Bight. About 1 mile westward of Toftebjerg Mill, and 1,200 yards offshore, is a detached patch of 1¾ fathoms.

The general depths in the bay are from 5 to 7 fathoms, but a patch of 4 fathoms lies a little northward of its center.

Anchorage.—The bay has a clear sandy bottom and good holding ground, but westerly winds cause a heavy sea, and vessels should weigh on a change to that quarter.

Maarup, about ½ mile eastward of Asmör Hook, is a small harbor, with a depth about 10 feet, sheltered by a west breakwater about 250 feet in length in a southeast direction, and a short arm extending in a southwest direction toward its head, the entrance, facing southeast, being about 30 feet in width.

There is a depth of 1½ fathoms in a dredged channel to the harbor, but gales from northwest to northeast raise the water 3 feet, and those from southwest to southeast lower it about the same.

Light.—From a white post, 10 feet in height, on the west breakwater head, a fixed red light is exhibited, at an elevation of 16 feet above high water, but it is only shown from September 1 to May 1.

Leading lights.—Two green lights have been established northeastward of the harbor, and one red light northwestward of the harbor. They are only shown when steamers are expected. In connection with the red light on the west breakwater they serve as leading lights to the harbor.

Shoal.—A shoal, with a depth of ¾ fathom over it, lies 200 yards southwest of the harbor.

Buoys.—The west side of the ¾ fathom patch is marked by a red spar buoy, surmounted by an upturned broom, moored in 1¼ fathoms; and the dredged channel is marked by spar buoys.

A warping buoy is moored 100 yards from the breakwater end.

Communication.—A telephone office is near the harbor, but the telegraph is at Nordby, 1½ miles distant, and the post office at Tranebjerg, distant 9 miles.

Water can be obtained.

Submarine telegraph cable.—A telegraph cable crossing from Sæl Bight to Hov is marked by telegraph beacons. (See Chapter I.)

Sæl Bight—Pier.—A pier about 320 feet in length at Sæl Bight has depths of from 1¼ to 1½ fathoms alongside.

Ringebjerg Sand, a triangular-shaped shoal, extends to a point in a northwest direction, for a distance of 1¼ miles, from the south point of Samsö Bay; for about 600 yards from the shore it has a depth of about half a fathom, but for the remainder the depths are from 2 to 2½ fathoms.

At about 1,200 yards and 1 mile respectively northward of the north edge of Ringebjerg Sand are patches of 2¾ and 3 fathoms.

Buoy.—A white can buoy, surmounted by one downturned broom, is moored, in a depth of 3 fathoms, westward of the extreme of Ringebjerg sand.

Kolby Kaas, situated nearly 4 miles southward of the south point of Samso Bay, is formed by a south breakwater which, with changes, has a general northwest direction, for 1,080 feet, with a north breakwater, about 400 feet in length, extending in a westerly direction from the shore toward its head, the area inclosed being about 4½ acres, and the entrance, facing north-northwest, about 160 feet in width.

There is a depth of 2 fathoms in the entrance, and that depth is found alongside the west breakwater, but the harbor becomes shallower to the eastward. The water is raised and lowered by gales in a similar manner to Maarup.

Light.—A fixed green light is exhibited, at an elevation of 13 feet above high water, from an iron post on the west breakwater head.

Shoal.—A shoal, with a depth of 4½ fathoms over it, is situated ¾ mile north-northwest of Kolby Kass.

Buoy.—A white spar buoy, surmounted by a straw wisp, is moored in a depth of 2¼ fathoms to mark the shoal water northward of the harbor.

Communication.—The post and telephone offices are near the harbor, the latter connecting with Tranebjerg, which is the nearest telegraph office, and distant 4 miles.

Coal and supplies.—Some coal is stocked at the harbor, and fresh provisions and water may be procured at Kolby Village, 1 mile from the harbor, but the water is not good.

Directions.—If proceeding from the northward along the west coast of Samsö, and having passed between Lille Ground and Isse Head Flat on the leading mark, the water is deep between Tunö and Samsö, with 21 fathoms in midchannel, so that no marks are necessary, and at night Tunö Rön and Tunö lights are a sufficient guide.

The east side of Helgenæs touching Kolsor Hook, bearing 330°, leads westward of Ringebjerg sand, in a depth of 4 fathoms, and in a large vessel, by opening the marks, deeper water may be obtained, but the mark to lead in the deepest water and in midchannel between Samsö and Svane Ground is Kolby Kaas entrance seen between Vestborg Lighthouse and Grydenæs Point, bearing 154°, keeping more to the southward when abreast Svane Ground to avoid a 4½ fathoms shoal ¾ mile northwest by north of Kolby Kaas.

By night.—Vestborg Light in line with Kolby Kaas Light, bearing 152°, leads in midchannel between the northeast end of Svane Ground and Samsö.

Vestborg.—From Kolby Kaas the coast trends to the southward for 1⅞ miles to Vestborg, the southwest point of the island.

Light.—A cylindrical white tower, 62 feet in height, on Vestborg, exhibits, at an elevation of 118 feet above high water, a fixed and flashing white light. It is visible 17 miles.

Fog signal.—An explosive fog signal gives a double report every 5 minutes when the mail steamer is expected.

South coast.—The south coast of Samsö trends in an east-southeast direction for 2½ miles to Ljus Hook, Brattingsborg house and wood being a short distance within it.

Depths offshore.—The shore bank, with depths under 3 fathoms, extends for about ½ mile southward of Vestborg and Ljus Hook, but between these its distance from the shore is about ¼ mile, and the 5-fathom contour line is generally about ¾ mile off.

Two shoals, with depths of 4¼ and 4½ fathoms over them, lie respectively fully 1 mile southwest and ¾ mile south-southwest of Ljus Hook Lighthouse.

Light.—On Ljus Hook, the southeast point of Samsö, a white tower, 28 feet in height, with a gray roof, exhibits, at an elevation of 25 feet above high water, an unwatched group flashing white light. It is visible 10 miles.

East coast.—From Ljus Hook the east coast trends in a north-northeast direction for 7½ miles, and is then continued in a strip of land, 2½ miles in length and about 200 yards in breadth, known as Besser Reef, and which forms the east side of Stavns Fiord; this coast is generally low.

Depths offshore.—Between Ljus Hook and Besser Reef the shore bank scarcely exceeds a distance of ¼ mile off the east coast, and is steep-to except off Ballen; eastward of Besser Reef it extends fully 1 mile, and will be described hereafter.

Ballen, a small harbor nearly 3¼ miles northward of Ljus Hook, has two breakwaters, the southern, with a general northeast direction, being about 425 feet, and the northern, with an easterly direction, about 260 feet in length, with an entrance between their heads about 50 feet in width, and having an area inside of less than 1 acre.

There are depths of from 1 fathom to 1¼ fathoms in the entrance, and about the latter depth inside. Gales from northwest to northeast raise the water, and those from southwest to southeast lower it fully 3 feet. A warping buoy is moored 150 yards outside the harbor.

Lights.—A fixed red light is exhibited, at an elevation of 16 feet above high water, from a white post, 10 feet in height, situated on the south breakwater head.

A fixed white light is shown from a post in the harbor at an elevation of 62 feet above high water, when vessels are expected.

Communication.—A telephone office near the harbor is in communication with Tranebjerg, distant 2½ miles, which is the nearest telegraph station; the post office is at Kolby, distant 4 miles.

Coal.—There is sometimes as much as 1,000 tons of coal in stock, and water can be obtained from wells.

Submarine telegraph cable.—A cable connects Ballen with Revsnæs, and the shore end is marked by two white telegraph posts, surmounted by triangles.

Besser Reef, a narrow strip of land which commences about 7½ miles north-northeast of Ljus Reef, is less than 200 yards in width, and has a slight elbow to the eastward, northward of which and on its west side is Hönsepol, a conspicuous hill, forming a good mark; it terminates to the northward in Havne Hook.

Beacon.—A black wooden beacon, 13 feet in height, and surmounted by two horizontal planks, marks Havne Hook.

Depths offshore.—Eastward of Besser Reef is an extensive shoal flat, with rocks and shoal spots on it, which at its southern end is nearly 1½ miles offshore, and skirts the east side of Besser Reef at about 1 mile off. From Havne Reef this shoal extends about 2 miles in a northeast direction, is about 1½ miles in width, and has islands and shoals on it; it is known as Lindholm Reef.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in about 3¼ fathoms on the northeast side of Lindholm Flat.

Lindholm, an island about 1,600 yards in length, in an east-northeast and opposite direction, and narrow, lies about ½ mile east-northeast of Havne Hook on the flat already described; it is highest at its western end.

Stubs Bo, rocky, with depths under 1 fathom, lies about 1,200 yards southward of Lindholm, Djævle Bo, with 1¼ fathoms water over it, is about ⅓ mile southward of Stubs Bo, and Klummer Bo, with 5 feet, is ⅔ mile westward of Djævle Bo.

A red spar buoy, surmounted by an upturned broom, is moored in a depth of 2¼ fathoms, southward of Djævle Bo.

Kyholm, about ½ mile west-northwest of the west point of Lindholm, and the same distance northward of Havne Hook, is a round island with some small trees, and about ¼ mile in extent.

Kyholm Sound, formed by Kyholm Channel and Lindholm Channel, separates these islands from Samsö, and passes westward of Kyholm and to the west end of Lindholm, where the deeper water of the former channel ceases on account of the shoal southward of the latter island.

Depths.—Kyholm Channel and Lindholm Channel have depths of from 5 to 7 fathoms, but the least water in the sound is about 2½ fathoms.

Buoys.—A red spar buoy, surmounted by three upturned brooms, is moored in a depth of 2¼ fathoms on the west side of the channel.

A white spar buoy, surmounted by a straw wisp, marks the east side of the channel; moored in 2¼ fathoms water southwest of Kyholm.

Kyholm Bo, with a depth of ¾ fathom over it, lies ½ mile north-northeast of the east point of Lindholm, and is marked on its northeast side by a red spar buoy, surmounted by an upturned broom, in a depth of 3 fathoms.

Stavns Fiord, fully 2 miles square, and sheltered on the east by Besser Reef, is entered from the northward between Havne Hook and a point 1 mile westward of it. About ½ mile south-southwestward of this latter point is Langöre, and farther south are several islands, scattered over the fiord, the principal of which are Ydersholm, Mejlesholm, and Hjortholm.

Beacon.—On the northern side of Mejlesholm, which island is situated nearly in the center of the fiord, is a wooden beacon, 33 feet in height, painted black, and surmounted by a red ball.

Arme Head is situated about ½ mile northwestward of the western entrance point to Stavns Fiord.

Beacon.—A wooden beacon, painted black, and surmounted by a triangle, stands on the summit of Arme Head.

Dangers.—From Arme Head a triangular-shaped shoal extends in a northeast direction, for a distance of 1½ miles to a point which forms the west side of the entrance to Kyholm Channel, and on it are the following dangers:

Kaages-Öre Boer extends from 500 to 1,200 yards northeastward of Arme Head, the western part being awash, and the remainder with depths of from 2 feet to 2 fathoms. Ydre Kaages-Öre Bo is about 150 yards northeastward of Kaages-Öre Boer, and has a depth of 1 fathom over it.

Morten Henriks Bo, rocky patches with about 1¼ fathoms water over them, is nearly 1 mile northeast of Arme Head and 400 yards farther in the same direction, is a rock with ¾ fathom over it.

Buoys.—A red spar buoy, surmounted by an upturned broom, is moored in a depth of 2 fathoms, on the northeast side of Ydre Kaages-Öre Bo.

Morten Henriks Bo is marked on its eastern side by a red spar buoy, surmounted by two upturned brooms, in 2 fathoms water.

Langöre, on a point of land extending in a southerly direction from the northwest side of Stavns Fiord, has two quays, the fronts of which, 65 and 165 feet in length, face southward, and from the eastern side, of the eastern and shorter quay, a small pier extends in a northeast direction; the harbor fronting the quays, with depths under 3 fathoms, is about two-thirds of a cable square.

Light.—A fixed red light is exhibited, at an elevation of 13 feet above high water, from a gray post, 13 feet in height, on the east side of the quays at Langöre, when vessels are expected.

Depths.—The entrance channel to Langöre has depths of 2¼ fathoms, over a space of 600 yards in breadth, and there is the same depth at the east quay; alongside the west quay the depth is 1¾ fathoms.

The channel into Stavns Fiord, which passes southward of Langöre and westward of Hjortholm, is narrow, but has a depth of 2 fathoms.

Buoys.—Three barrel buoys, painted black, mark the channel near Langöre, and anchorage is prohibited in a certain area near these buoys.

Pilots can be obtained at Langöre.

Tidal streams.—There is a regular ebb and flow for six hours each way, in moderate weather.

Communication.—A telephone office near the harbor is connected with Nordby and Tranebjerg, which latter place is the nearest post and telegraph office.

Water.—Good water can be procured near the harbor.

Beacon.—A white masonry beacon, formerly the substructure of a mill, is situated about 1,600 yards eastward of Besser Church.

Directions.—To enter through Lindholm Channel, westward of Djævle Patch, the west side of Ellemandsbjerg should be brought in line with the eastern end of the highest part of Lindholm bearing 332° until the east side of Kyholm touches the west side of Lindholm, 308°, forming a saddle, when steer on this line until Arm Head and Havne Hook Beacons come in line 267°, and alter course for them.

When Nordby Church is in line with the north end of Maarup Town, bearing about 288°, it should be steered for until Oggeldal Skaar and Bylykke Skaar are in line, when alter course for them, and when the redoubt on the highest part of Kyholm touches the small trees on the west end of that island Toftbjerg Mill between Langöre East Quay and Hjortholm, 216°, leads up the channel to Langöre.

Entering through Kyholm Channel, between Kyholm and the spar buoy westward of it, Mejlesholm Beacon should be kept between Besser Church and the trees immediately westward of it, the church being its own breadth to the left of the beacon, bearing 194°, until the redoubt on the highest part of Kyholm is touching the bushes at the west end of that island, which mark should be kept on until Besser Church is in line with the westernmost of three connected mounds westward of Mejlesholm Beacon (about 191°), and steering for this until the south point of Vejro opens south of Kyholm about 75°, when alter to the southeastward, steering for Hönsepol.

When Besser Church is just eastward of the middle one of the three mounds already mentioned, about 193°, it should be steered for until Toftbjerg Mill is between the east end of the east quay at Langöre and Hjortholm, bearing 216°, which mark leads in the channel to Langöre.

Anchorage.—Kyholm Sound is a good summer anchorage, but in winter it is exposed to drift ice.

Coast.—From Arme Head the coast trends in a northerly direction for 5 miles to Isse Head; Maarup Town, Nordby Church, and Village are the conspicuous objects.

Depths offshore.—From Arme Head the shore bank, with depths under 3 fathoms, commences to draw off the coast, and 2 miles southward of Isse Head it is a mile offshore, from which the edge has a north-northwest direction and forms the east side of Isse Head Flak.

Samsö Flat.—From the southern end of Besser Reef the 10-fathom contour line takes an easterly direction for 10 miles, then turns to the northward for 2 miles.

The 10-fathom contour line which incloses Isse Head Flat has an east-southeast direction for about 13½ miles, till it meets the preceding, and the triangular area inclosed is known as Samsö Flat, with general depths of from 5 to 9 fathoms and on which are several shoals, which will be described.

Vejrö, a small flat island covered with bushes, is about 800 yards in extent and 75 feet high on its eastern side; on the south side a yellow slope is conspicuous. The island and the shoal extending from it is separated from Lindholm Flat by Lindholm Deep, in which the depths are from 7 to 11 fathoms.

From the western end of the island a reef of rocks, nearly dry, extends in a west-northwest direction for a distance of ¾ mile, breaking down steeply to Lindholm Deep on its west and south sides, and from the north end a shoal prong, with from 2¼ to 3¾ fathoms water, stretches in a north by east direction for about 1¼ miles; the shoal water is only about 400 yards off the south and less off the east side.

Buoy.—A white can buoy, surmounted by two downturned brooms, is moored in a depth of 6 fathoms at the western end of the reef extending from the west point.

Vejrö Flat.—A ridge of shoal water, about 600 yards in breadth, extends for 1¼ miles northward of the east end of Vejrö and connects with Vejrö Flat, which is 3 miles in length in an east and west and 2 miles in breadth in a north and south direction within the 5-fathom contour line; the depths on the ridge and flat are from 2¼ to 2¾ fathoms, except at the west end of the latter, where there is 1½ fathoms. The bottom is fine light sand and rocks in places.

Flensborg Ground, with a depth of 1¼ fathoms over it, lies at the east end of Vejrö Flat.

Buoys.—A white can buoy, surmounted by a down-turned broom, is moored, in a depth of 4 fathoms, ½ mile west-northwest of the 1½ fathoms depth on Vejrö Flat.

A conical red buoy, surmounted by an up-turned broom, is moored in 4¾ fathoms water, on the east side of Flensborg Ground.

Langballe Ground, about ½ mile in extent, with a least depth of 3 fathoms, lies 2¼ miles west-northwest of the west point of Vejrö.

Clearing marks.—Besser Church, in line with Mejlesholm Beacon, bearing 193°, leads westward, or the same church open east of Kyholm, 199°, leads eastward of Langballe Ground.

Löghöj on Mols Head well open southward of Sletter Hook old lighthouse, bearing about 320°, leads between Isse Head Flat and the 3¾-fathom patch, which lies 3¾ miles north by east of Isse Head.

Bosserne, a small narrow island about 1,200 yards in length in an east and west direction, lies ½ mile southeast of Vejrö, separated from it by Vejrö Sound, in which the depths are from 11 to 17 fathoms, but at the eastern end the depth is reduced to about 8 fathoms on Samsö Flat.

The island is on the western, steep-to, edge of a shoal flat, about 2¾ miles in length in a north-northeast and opposite direction, and 1½ miles in breadth, with depths of 1¼ to 2¾ fathoms over it. Within the 5-fathom contour line are patches of 2 and 3 fathoms, about ½ mile northeast and one of 2¼ fathoms nearly the same distance eastward.

Beacon.—On the northwest point of Bosserne is a black pole beacon, 20 feet in height, surmounted by a black ball.

Hatter Reef, the western end of which is nearly 2 miles south-southeastward of Bosserne, is a small sandbank about 800 yards in length in an east and west direction, with the shoal, on which it lies, extending about 1 mile west-northwest and 1,200 yards east of it. A rocky shoal, with 2¾ fathoms water over it, lies nearly ½ mile from its east end.

Beacon.—On the highest part of Hatter Reef is a red and white vertically striped beacon, 30 feet in height, which is surmounted by a red staff and a ball.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 5 fathoms, 300 yards southeastward of the eastern 2¾-fathom shoal of Hatter Reef.

Munke Ground and Middel Flat.—At the eastern end of Samsö Flat are two groups of shoals, of which Munke Ground, the northern, consists of patches, with depths of from 2¼ to 3 fathoms, extending over a space of 2¼ miles in an east and west direction.

Middel Flat, the southern, extends for a similar distance in the same direction, within the 5-fathom contour line, and has a least depth of 2¾ fathoms.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 8 fathoms, 1,400 yards eastward of the eastern patch on Munke Ground.

Marthe Flat, lying between Samsö Flat and Mosel Ground, separated from the former by a channel about ¼ mile in width, with depths of from 12 to 17 fathoms, and from the latter by one about 1,200 yards in width, with depths of from 12 to 20 fathoms, is 5½ miles in length, in an east and west direction, and about 3 miles greatest width, within the 10-fathom contour line. The general depths are from 4½ to 9 fathoms, but a patch of 3 fathoms and one of 3¾ fathoms lie near the south and north edges, respectively.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 6 fathoms, 200 yards southward of the 3-fathom patch on Marthe Flat.

Clearing marks.—Arme Head Beacon, open of the highest part of Kyholm, bearing 231°, leads northwest, and Besser Church open of the east point of Vejrö, 221°, leads southeast of the 3-fathom latch, in a depth of 4½ fathoms.

Hatter Barn, which lies 1½ miles southeast of Hatter Reef, is about 1⅝ miles in length, in a northerly and opposite direction, within the 5-fathom contour line, and has two shoals on it of 2½ and 2¾ fathoms, the bottom being sand and gravel.

Lightbuoy.—A conical red buoy, exhibiting an occulting white light, which is eclipsed eight times every minute, is moored in a depth of 6 fathoms, ½ mile southeast of the southern shoal patch on Hatter Barn. When the lightbuoy is withdrawn on account of ice it will be replaced by a conical red buoy.

Directions.—Coming from the southward, Hjelm in line with the west point of Vejrö, bearing 9°, leads eastward of the shoal extending eastward of Besser Reef, and of Lindholm Flat, and when Asmör Hook is in line with the east end of Lindholm, 271°, steer 327°, for Ellemandsbjerg, passing through Lindholm Deep, between Lindholm Flat and the reef west of Vejro.

When Tranebjerg Church is in line with the east side of Kyholm, bearing 207°, steer 27°, using it as a stern mark, which will lead eastward of Langballe Ground (see also clearing marks, above), and westward of Vejrö Flat, in a depth of 4 fathoms, or deeper water may be obtained by closing the stern mark and keeping to the westward after passing Langballe Ground.

Or steering with Hjelm over the low west point of Vejrö, 9°, when abreast of Havne Hook Beacon alter course to pass westward of Bosserne Beacon, and after passing eastward of Vejrö, Kolhöj Mill in line with the east side of Vejrö 216°, leads eastward of Flensborg Ground and Asmör Hook well open of the north side of Vejrö, 261°, leads northward of the shoal extending north of Bosserne.

Vessels may also pass between Hatter Reef and Hatter Barn by keeping Dyret open northward of Besser Church, bearing 249°, while Arme Head Beacon in line with the north side of Hönsepol, leads southwest, or Besser Church nearly midway between Dyret and Onsbierge Church, 295°, leads southward of Hatter Barn.

Small vessels may pass between the south end of the shoal southward of Bosserne, and the reef extending westward from Hatter Reef by keeping Tranebjerg Church nearly touching the south side of Besser Church, bearing about 235°, until Asmör Hook is between the highest part of Lindholm and the bushes on Kyholm, 274°.

The shoals described form, with Yder Flat, those on the northwest side of the entrance to the Great Belt, southward of Schultzs Ground, the narrowest part of the channel being between the east end of Samsö Flat, and the shoal extending northwest of Gniben;

the channel is sufficiently wide for sailing vessels to work through, paying attention to the clearing marks for the various shoals.

For the northwest coast of Zealand and the shoals that lie on the southeast side of the above-mentioned channel, see Chapter IV.

Gunnery practice is carried out occasionally in the neighborhood of Lindholm Deep, the boundaries of the firing ground being as follows:

On the north, an imaginary line drawn east and west through the white can buoy (two down-turned brooms) marking Vejro Nord-vest Reef; on the south, a line drawn east-southeast and in the opposite direction through Staalhöjs Hook; on the west, a line north and south through the west point of Lindholm; and on the east, a line north and south through Hattern barn lightbuoy.

When firing is carried on by night, the firing area is lighted by electric searchlights, and vessels should then avoid the locality.

CHAPTER IV.

THE NORTHERN COASTS OF FYEN AND ZEALAND FROM ÆBELÖ TO GILBJERG HEAD, WITH THE OUTLYING ISLANDS AND SHOALS OF THE KATTEGAT.

Æbelö, situated 7 miles south by west of Kloben, the west end of Endelave, is fairly high, somewhat triangular in shape, and about 1 mile in extent; it is densely wooded except at its southern end, with steep slopes to the sea, and is connected with Æbelholm by a narrow strip of land. The lighthouse, being of dark color, and with dark trees in the background, is not very conspicuous.

Light.—From a cylindrical tower of granite, 60 feet in height, and situated on Nordrebrand, the northwest point of Æbelö, a group flashing white light is exhibited at an elevation of 66 feet above high water. It is visible 13 miles. For bearings see Light List.

Shoal.—A shoal, with a depth of 2 fathoms over it, lies about ⅔ of a mile northward of Æbelö Lighthouse.

Buoy.—A white can buoy, surmounted by a downturned broom, is moored in a depth of 3 fathoms northwest of the shoal.

Agernæs, a high, wooded promontory, extends in a northwest direction, its extreme being 4 miles east-southeast of Æbelö, and on the land to the southward of these points are Sandager, Klinte, Grindlöse, Nörre-Höjrup, and Nörre-Næraa churches, and Agernæs mill, with a red structure.

Depths offshore.—Æbelö is surrounded by shoal water, with depths under 3 fathoms, which extends for a distance of about ½ mile, and is connected with the shoal water extending west by north of Agernæs. The 5-fathoms contour line is about 1,600 yards northward and northwestward of Æbelö.

Between Æbelö, on the south, and Björnsknude and Endelave on the north, the channel is about 3 miles in width, with depths of from 9 to 14 fathoms, and no dangers exist, except toward either shore.

Shoal water, with depths of from 1 foot to 3 feet over it, extends for a distance of 2 miles west by north of Agernæs, joining that eastward of Æbelö by a narrow ridge, on which is a depth of 2¾ fathoms; inside this is a small basin nearly 1½ miles in diameter, and having depths of from 3¾ to 7 fathoms.

Anchorages.—There is anchorage along the shore, with offshore winds, the holding ground being good, also on the eastern side of

Æbelö, in from 2 to 4 fathoms water, except with winds from northwest to northeast.

A vessel should not be further west than to have Sandager Church open east of Æbelö, nor southwestward of Bogense Church in line with the center of Æbelholm, 232°.

Coast.—From Agernæs the coast trends in a southeast direction for about 11 miles to Enebær Point, and is flat and bare; about 3¾ miles south-southeast of Agernæs is Hundstrup (Krogbölle) Church. From abreast this church the shoal water extends offshore for about 1¼ miles, with depths under 3 fathoms, the 5-fathoms contour line being about 1½ miles offshore, but nearing it to 1 mile further southeast.

Odense Fiord is entered between Enebær Point, the southeast point of Hals, which is low and covered with bushes, and situated on the west and Skoven on the east side.

The fiord extends for a distance of 8 miles in an east and west direction, with a greatest breadth of 5 miles, and the channel winds through it to a canal which communicates with Odense City, about 9 miles in a direct line from the entrance; a branch channel, named Egense Deep, extending northwestward from the main channel.

At about 1½ miles north-northwest of Enebær Point shoal water, with depths under 3 fathoms, extends about ½ mile offshore, from which the bank gradually closes the shore to the point; the eastern side of the entrance has a shore bank extending off about 400 yards.

Light.—A tower, 45 feet in height, painted white, with a gray roof, situated on Enebær Point, exhibits, at an elevation of 43 feet above high water, a fixed light, having white, red, and green sectors, which are visible 12, 10, and 8 miles, respectively. For sectors, see Light List.

Entrance—Depths.—The entrance is narrow, and inside the channel has a general south-southwest direction for about 3 miles in a direct line, but it has several bends; it then turns to the westward to the entrance to the canal.

The approach is along the eastern shore in a channel, with depths of from 6 to 8 fathoms, and the depths in the entrance and in the fiord are from 3½ to 4 fathoms.

The canal is 4½ miles in length, with a breadth of nearly 200 feet, and from 50 to 65 feet on the bottom, the depth is 3¼ fathoms; it is proposed to enlarge it.

Buoyage—Bellbuoy.—A red and white striped bellbuoy, surmounted by a ball, is moored, in a depth of 6¾ fathoms, 1.4 miles northward of Enebær Point Lighthouse.

In winter it is replaced by a conical red and white striped buoy, surmounted by a ball.

Beacons.—There are 13 beacons (Nos. O to XII) in the channel, consisting of red and white striped masts, the outer beacon (No. O) being half a mile northeast of Roholm; there are also 10 wooden leading beacons, surmounted by triangles, ovals, and disks.

The starboard side of the channel is marked by red spar buoys, surmounted by brooms, and the port side by white spar buoys, surmounted by straw wisps, in accordance with the Danish system of buoyage, but at several points in the channel there are also wooden buoys.

Odense Harbor consists of Gamle Harbor and Nye Harbor, of which Gamle Harbor, the western, is about 300 yards in length, in a north-northwest direction, with a greatest breadth of about 40 yards; Nye Harbor, parallel to it and separated by quays, is about 250 yards in length and nearly 100 yards greatest width, the whole area being about 8 acres. The quayage is 4,430 feet.

Light.—A fixed red light is shown at Odense Harbor.

Depths.—The depths in Gamle Harbor are from 2 to 2½ fathoms, and in Nye Harbor from 2¾ to 3½ fathoms, but the water is raised about 4 feet by gales from northwest to northeast and lowered the same amount by those from southeast to southwest.

Ice breaker.—A powerful ice breaker is employed to keep the channel clear when necessary.

Storm signals are shown from a mast situated on the quay between Gamle and Nye Harbor; additional storm signals are also made, and weather notices are posted at the customhouse. (See Chapter I.)

Pilots.—Pilotage is compulsory for vessels over 80 tons burden, and pilots may be obtained on the east side of the entrance or at Stige, about 3 miles from the harbor.

Tug.—A tug is available.

Directions.—Loddenhöj, a hill 191 feet high on the southeast side of Odense Fiord, in line with the middle of the entrance bearing 176°, leads to the eastward of the bellbuoy, or, if it can be seen, Kolby Church open westward of Vestborg Lighthouse, 359°, is a good mark, and Charlottenlund Wood, which is small and lies westward of Hals, is conspicuous on the low coast. Mid-channel should be kept near the entrance, the lead giving warning of the approach to shoal water on either side; the west side should be kept when within.

By night.—The sector of white light from Enebær Point, between the bearings of 163° and 179°, leads clear to the entrance.

Anchorage.—The anchorage is inside the entrance, southward of the lighthouse.

Tidal streams.—In Odense Fiord there is a regular flood and ebb tide, the stream changing every six hours. Outside the entrance the

ingoing stream sets strongest along the cost on the west side, from eastward of Christiansminde, and has greater velocity in settled weather, its strength being increased by the approach of a westerly gale.

The outgoing stream is stronger on the east side as far as Fyens Head, and is strongest with gales between southwest and southeast; it is affected both in duration and strength by the prevailing wind.

City.—Odense is one of the oldest, prettiest, and cleanest towns in Denmark, the name being edrived from Odins Ey, or island of Odin, for here Odin had a chief temple. The cathedral of St. Knud, commenced in 1086, is a fine specimen of early pointed Gothic architecture; there is a small but perfect museum, two theaters, and the city is lighted by electricity. In 1911 the population was 42,237.

Communication.—A railway connects Odense with Copenhagen. via Nyborg, and there is also communication with Fredericia, the railway station, post and telegraph offices are nearly ¾ mile from the harbor, but the telephone office is close to it.

Repairs.—Some repairs to machinery might be effected, and a crane will lift 10 tons.

Time signal.—A time signal is given daily, 1h. 0m. 0s. p. m., mid-European time, at the telegraph office. (See Chapter I.)

Trade.—The exports are agricultural produce, and imports feeding stuffs and coal. The manufactures are beer and spirit, vinegar, cotton spinning, tanning, yeast, salt refinery, cheese, wool, color and dyeing, manure, chemicals, cigars and tobacco, margarine, chocolate, skin motor clothing, gloves, mustard, and sugar.

Coast.—Skoven, the promontory on the east side of the entrance to Odense Fiord, is almost circular at its end and about 2¼ miles in diameter, and on its eastern side is Dalby Bay, extending about 1½ miles in a south-southeast direction, with a breadth of about ½ mile; it affords anchorage with good holding ground with all winds except those from northwest.

From Dalby Bay the coast trends in a northerly direction for about 4 miles to Kors Harbor and is a beach, with bare land, but has several hills without wood.

The most conspicuous objects are Stubberup Church and Mill. Kors Harbor Beacons, and Baes Banke, 81 feet high, of which Fyens Head is the north extreme.

Depths offshore.—The shore bank surrounds Skoven at a distance of about 400 yards, but at the head of Dalby Bay depths under 3 fathoms extend about 1,200 yards; from the bay the west coast of Hindsholm Peninsula has depths under 3 fathoms extending generally about 600 yards off, but immediately southward of Havrebjerg Mill there is a depth of 3¾ fathoms extending fully 1 mile offshore.

Kors Harbor, the entrance to which is between a shoal extending northward from Langö Head and another projecting from the southwest side of the land of Fyens Head, extends about 1 mile in an east-northeast direction, to a small basin, affording anchorage, and making a good winter harbor for small vessels bound to Odense, when that fiord is inaccessible.

Dangers.—A shoal, with a depth of 1½ fathoms over it, lies 600 yards northwest of Langö Head and inside it the point of the shoal, forming the south side of the entrance channel, has ¾ fathom over it.

The extreme of the shoal stretching in a southwest direction toward the north side of the entrance has a depth of ¼ fathom.

Buoys.—The 1½-fathom shoal on the south side of the entrance is marked on its north side by a red spar buoy, surmounted by two upturned brooms, in 3 fathoms water.

The shoal on the north side is marked on its south side by a white spar buoy, surmounted by a straw wisp; it is in 2¼ fathoms.

Depths.—The depth in the entrance channel is 2 fathoms, and from 2 to 3 fathoms at the anchorage.

Beacons.—Two leading beacons are situated in Kors Harbor.

The rear beacon, 36 feet in height, and consisting of a pole, surmounted by a barrel, stands at the head of the bay.

The front beacon, 26 feet in height, and similar to the preceding, is on a small tongue of land, extending from the northern side, and 800 yards, 225°, from the rear beacon.

Directions.—Brattingsborg Wood, on the south end of Samsö, open west of Fyens Head, bearing 7°, leads westward of the shoal water extending from Kors Harbor, and the rear beacon should be opened northward of the front beacon, about 49°, until past the red spar buoy, on the starboard hand, or till the whole of the northern part of Mejlö is open north of Langö Head about 214°, when bring the beacons in line, about 45°, and steer with them so into the harbor, passing about 100 yards southward of the tongue of land on which is the front beacon, and anchoring when 200 yards inside it, in a depth of 3 fathoms, good holding ground.

Small craft and boats will find good shelter behind the tongue of land above mentioned.

Fyens Head is the north extreme of Bæs Banke, a conspicuous hill, 81 feet high, and from it shoal water, with depths under 3 fathoms, extends for a distance of 700 yards; the northern edge of the shoal then trends eastward for a mile, and projects to the northward for about 1,200 yards in a prong, the northern extreme of which is 1¼ miles from the north end of Hindsholm; the eastern edge of this shoal has a southerly direction to the east side of Hindsholm.

Buoy.—A white can buoy, surmounted by two downturned brooms, is moored, in a depth of 3 fathoms, on the north side of the shoal prong.

The northeast coast of Fyen is described in Chapter VII.

Lille Ground, separated from the preceding shoal by a channel 600 yards in breadth, with a depth of over 3 fathoms, is a rocky reef, which, within the 3-fathoms contour line, is ½ mile in length, in a north and south direction, and 400 yards in breadth; it has a least depth of ¾ fathom, is steep on its east, but less so on its west side.

A shoal, with a depth of 2½ fathoms over it, lies southward, and two shoals of 3 and 4¼ fathoms lie eastward of Lille Ground.

Light-and-bellbuoy.—A white lightbuoy, exhibiting an occulting white light, eclipsed eight times every minute, and having also a bell, is moored in a depth of 7¾ fathoms, close northward of Lille Ground. When removed on account of ice, it is replaced by a conical white buoy.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 5 fathoms, 400 yards southeast of the south end of Lille Ground.

Clearing mark.—Kolhöj Mill, open eastward of Ljus Hook, bearing 349°, leads eastward of Lille Ground.

Paludans Flat, the northern end of which lies 1¾ miles southward of Vestborg Lighthouse, extends in a southerly direction within the 5-fathoms contour line, for a distance of 2½ miles; it has two patches of 2¾ fathoms on it, the southern being 3½ miles south of Vestborg Lighthouse, and with the exception of this last patch, the whole of the shoal consists of fine white sand.

Buoy.—A white can buoy, surmounted by three down-turned brooms, is moored in a depth of 4 fathoms, on the north side of Paludans Flat.

Bolsax, a small rocky reef, with a least depth of ¾ fathom, lies 5½ miles northeastward of Fyens head, on a bank nearly 1½ miles in length, in an east and west direction, and ½ mile in width, within the 5-fathoms contour line. The north and east sides of the bank are steep-to.

Buoy.—A red conical buoy, surmounted by two upturned brooms, is moored in a depth of 5 fathoms, ½ mile eastward of Bolsax.

Clearing mark.—Kolby Church, in line with the first cliffy hummock westward of Brattingsborg wood bearing about 331°, leads, in a depth of 7 fathoms, southwest of Bolsax.

Falske Bolsax, with a least depth of 1¾ fathoms, lies 1½ miles northeast of Bolsax, and is 1,200 yards in length, within the 3-fathom contour line; a shoal with a depth of 3¼ fathoms lies 800 yards east if its south end, and one of 3¾ fathoms about 1 mile northeast of Falske Bolsax.

Lightbuoy.—On the northeastern side of the 1¾-fathom head a lightbuoy painted red and marked "F.–Balsax" exhibits a group flashing green light giving a group of two flashes every 10 seconds. In winter it is replaced when necessary by a red spar buoy.

Bellbuoy.—A red bellbuoy, surmounted by three upturned brooms, is moored 100 yards 253° from the lightbuoy. When withdrawn on account of ice it is replaced by a conical red buoy, surmounted by three up-turned brooms.

Clearing marks.—Kolby Mill, a little inside the northeast end of Brattingsborg wood, bearing 307°, leads northeast of Falske Bolsax, and between it and the 3¾-fathoms patch; while the same mill, over the center of Brattingsborg wood, 328°, leads midway between Bolsax and Falske Bolsax.

Directions.—In addition to the shoals that have been described the channel between Fyens Head and Samsö is encumbered with a number of isolated patches, with depths of from 3½ to 4¾ fathoms over them, and the bottom is generally irregular, so that the soundings are little guide, but in clear weather a deep-draft vessel may pass between them, the channels southward of Bolsax and northward of Paludans Flat being preferable.

A vessel of deep draft, coming from the Great Belt, can bring Mollebakke mill in line with the west end of the highest part of Brattingsborg Wood, bearing 343°, which leads eastward of Lille Ground, and between Paludans Flat and Bolsax.

Revs Cape, the west point of Zealand, and the extreme of a promontory about 1½ miles in width, which forms the north side of Kallundborg Fiord, is composed of bare hills about 200 feet high, lowering to the extremity, which is a steep cliff 33 feet high.

Light.—On the extreme of Revs Cape is a square white tower, 50 feet in height, which exhibits, at an elevation of 79 feet above high water, a flashing white light. It is visible 14 miles.

The lighthouse has a flagstaff and four white buildings near it.

Signal station.—Revs Cape is a signal station, and vessels can communicate with it by the International Code.

Pier.—There is a pier at Revs Cape.

Revs Cape Puller, rocky, and extending 1 mile west-northwest from Revs Cape, has general depths of from 1¼ to 2¼ fathoms over it; Revs Cape Reef extends 1,000 yards from the point, with ½ fathom at 700 yards from it. The outermost shoal, with a depth of 1 fathom, is 1 mile from the point.

There is a channel across the reef marked on its eastern side in a depth of 3 fathoms by a white buoy with one down-turned broom, and on its western side in the same depth by a red buoy with two brooms. The least depth in the channel in 1911 was 20 feet.

Light-and-whistlebuoy.—A white lightbuoy, exhibiting a flashing white light, with a period of 15 seconds, and having a whistle, is moored in a depth of 6 fathoms, at the west end of Revs Cape Puller. When withdrawn on account of ice it is replaced by a conical white buoy.

Coast.—Gniben, on Cape Zealand, is situated 21½ miles northeastward of Revs Cape, and between is Sejrö Bay, which recedes about 11 miles from the line of the two points. Sejrö is situated in the middle of the bay.

From Revs Cape the coast, trending in an easterly direction for about 15 miles to Nexelö, is hilly for the first part and then low, without many trees. Raklev Church, standing high, and three mills together, near the beach at Vröj, with also a chimney, are conspicuous.

Depths offshore.—For the first 6½ miles the shoal water, with depths under 3 fathoms, extends about 600 yards offshore, but at that distance Volderup Reef, with about 4 feet water, extends in a north-northwest direction for about ¾ mile, and the 5-fathoms contour line commences to draw offshore.

About 5 miles farther east of Saltbæk Bight shoal water under 3 fathoms extends for a distance of 2½ miles north-northwest of Nörre Head, and outside the 5-fathoms contour line are shoals of 4 to 4½ fathoms, which will be seen on the chart. A shoal, with a depth of 2¼ fathoms over it, lies in the center of a bight eastward of Nörre Head and fully 1 mile offshore.

Submarine telegraph cables.—A cable connecting Revs Cape with Ballen, in Samsö, is marked by two white telegraph poles surmounted by triangles.

From about 8½ miles eastward of Revs Cape, near Vröj, a cable crosses to Kongshöj, in Sejrö, and is marked by two white telegraph poles surmounted by triangles.

Nexelö, 2 miles in length in a north and south direction, about ½ mile in breadth and 135 feet in height at its north end, lies about ¾ mile off Stold. A mill on the middle part of the island is very conspicuous.

Nexelö is connected to the land by a dry bank, and shoal water, with depth under 3 fathoms, extends for nearly 1 mile off the west side of the south part, but only about ¼ mile off the northwest end. The shoal water about that distance off the north and east coasts of the island is fairly steep-to.

A telegraph cable connects the south point of Nexelö with the coast about ¼ mile westward of Havnsö.

Nexelö Bay, eastward of Nexelö, is nearly 3 miles square. On the south coast of Havnsö Mill, and about 2½ miles east-northeast of it Dragsholm Castle. From this northward to Ordrup Point, a dis-

tance of 4 miles, the land becomes hilly, and Veirhöj, the southern hill, is 395 feet high.

Depths.—The west side of the bay formed by Nexelö is fairly steep-to, but shoal water, with depths under 3 fathoms, extends about ¾ mile northwestward of the shore abreast Dragsholm Castle; the depths in the bay are from 3½ to 5 fathoms.

Havnsö Harbor, about 200 yards eastward of the mill, has a pier about 720 feet in length in a north by east direction, with a triangular head, the base, 200 feet in length, facing seaward. There is a depth of 2 fathoms alongside the outer end of the pier and 1¼ fathoms at each of the inner sides, but northerly winds raise the water about 1¾ feet, southerly winds lowering them by the same amount.

Light.—A fixed red light is exhibited at an elevation of 13 feet above high water from a post on the pier head when a vessel is expected.

Anchorage.—Although exposed to north and northeast winds, the bay, being protected by Sejrö and the off-lying banks, affords good anchorage, with little sea; the bottom is covered with seaweed.

Communication.—The nearest railway station and post office is at Jyderup, and telegraph at Snertinge; there is a telephone at Havnsö.

Supplies.—Fresh provisions and water can be procured.

Coast.—From Ordrup Point the coast trends eastward for 5 miles, then northward for a similar distance, and turns to the westnorthwest for 9 miles along the south side of Cape Zealand. Höve Mill, about 4 miles eastward of Ordrup Point, is near the termination of the highland that curves around from Vejrhöj, and from this northward the land is flat, but hilly again, at the commencement of Cape Zealand.

Sexhöje, 174 feet high and 6 miles northeast of Höve Mill; Lumbsaas Mill, which stands high; Odden Church; and Yderby Mill, and what is known as Gniben pilot house, are all conspicuous marks.

Depths offshore.—A prong of shoal water, with depths of from 1¼ to 3 fathoms, extends for a distance of 2½ miles westward of Ordrup Point, with detached shoal patches of from 2 to 2¾ fathoms between its end, and the space between the north end of Nexelö and the shoal extending southeast of Sejrö.

In the eastern part of the bay, northward of Ordrup Point, shoal water, with depths under 3 fathoms, extends off about 1½ miles, with some detached 3-fathom patches, west of it.

Ordrup Cape Flat—Buoy.—A white buoy with one downturned broom has been placed at a distance of about 200 yards 247° from the 1-fathom rock on the western end of the shoal.

Sejrö is 6 miles in length in a northwest and opposite direction, and about 1 mile in greatest breadth; its southeast end is 5 miles

west by north of Ordrup Point. In 1906 the population of the island was 790. There are several hills on it from 75 to 90 feet high, and Kongshöj, near the southeast end, is 98 feet. Sejrö Lighthouse, on the northwest extreme, and the church near the center of the island, are both conspicuous objects.

Light.—A cylindrical yellow tower, 62 feet in height, on Gniben, the northwest point, exhibits, at an elevation of 103 feet above high water, a group flashing white light, visible 15 miles. There are several white buildings to the southward of the lighthouse.

Ice signals, and those respecting lightvessels, are shown from a house near the lighthouse. (See Chap. I.)

Signal station.—Vessels can communicate by the International Code with a signal station at the lighthouse.

Dangers.—Shoal water extends from both ends of the island; that from the northwest point, known as Nordvest Reef, being rocks, covered and uncovered, and extending ⅓ mile. Shoal water, with depths under 3 fathoms, stretches ½ mile, and under 5 fathoms 1½ miles farther in the same direction from the end of the first shoal.

On the southwest side the shoal water, to the 3-fathom contour line, extends in places for nearly 1 mile, Tyrisborg, about 1¼ miles, 165° of Gniben, being about 1,800 yards offshore, and from the southeast end a spit, with depths of from 2 to 3 feet over it and steep-to on its northeast side, projects in a southeast direction for 2 miles, its extremity being named Kolen; between this and the 5-fathom contour line of the shoal extending west of Ordrup Point is a deep channel about ½ mile wide.

On the northeast side of the island the shoal water, with depths under 3 fathoms, is about ½ mile off, and the 5-fathom contour line generally about 1,200 yards distant from the shore.

A shoal, with a depth of 4 fathoms over it, lies 4¾ miles in a westerly direction, and one of 3¼ fathoms 1¾ miles in a west-northwest direction from Sejrö Lighthouse.

Light and whistle buoy.—A white lightbuoy, with "Sejrö N. V." on it, exhibits a flashing red light, with a period of ¼ minute, showing light, 5 seconds; eclipse, 10 seconds; it has a whistle, and is moored, in a depth of 7¾ fathoms, at the extreme of the shoal water extending from the northwest end of the island. When withdrawn on account of ice, it is replaced by a white spar buoy.

Submarine telegraph cable.—A telegraph cable leaving the southwest coast of Sejrö from about 1 mile westward of Kongshöj, near the southeast end of the island, connects with Fyen at about the same distance westward of Vröj, the position of the shore end being marked by two white telegraph posts, surmounted by triangles.

Sejrö Harbor, on the southwest coast of the island, is formed by a west breakwater, about 625 feet in length, in a southerly direction,

but curving somewhat to the eastward, a smaller harbor is situated about 150 yards eastward of the breakwater.

In the Gamle Harbor, or larger harbor, immediately eastward of the breakwater, the depths are from 1¼ to 2 fathoms, and in the small harbor about 1¼ fathoms. Winds between west and north raise the water 4 feet, and those from between east and south lower it the same amount.

Light.—On the extremity of the breakwater a fixed red light is exhibited, at an elevation of 19 feet above high water, from a post, 14 feet in height; the light is shown from 1st September to 1st May.

Communication.—The nearest railway station is at Kallundborg, but there are post, telegraph, and telephone offices at Sejrby Village.

Supplies of fresh provisions and water can be procured on the island.

Leveret.—On the southwest side of Sejrö, and distant about 2¾ miles from it, are two narrow shoals lying parallel to the island; the southeastern, with a least depth of 3¼ fathoms, is about 2¾ miles in length and 1,200 yards in greatest width. Leveret, the other shoal, with a least depth of 3 fathoms, is about 1¾ miles in length.

Clearing marks.—The north extremes of Isse Head and Vejrö in line, bearing 295°, lead northward of both shoals.

Yderby Mill, opens north of Gniben (Sejrö), bearing 68°, leads southeast of the 4-fathom patch, westward of Sejrö Lighthouse, and to pass southward of the same shoal Asmör Hook should be kept in line with Hatter Reef Beacon, 283°.

Directions.—From the westward, if proceeding to Nexelö Bay, Vejrhöj, in line with the north point of Nexelö, bearing 93°, leads northward of the shoal water extending from Saltbæk, in a depth of 4 fathoms, and rounding the north point of Nexelö, Bregninge poorhouse, a high-lying, solitary, tiled house, in line with Havnsö Mill, bearing 168°, leads 1,200 yards eastward of the north point of Nexelö, from which steer for an anchorage as convenient.

If coming from the northward, the northeast coast of Sejrö should not be approached in a less depth than 6 fathoms, and the light tower just open north of the northeast point, about 1¼ miles eastward of it, bearing 288°, will lead northward of the shoal water on that side of the island.

When Sejrby Church is in line with Kongshöj, 296°, Bregninge poorhouse should be brought in line with the east side of Nexelö, 165°, and steered for, which will lead between the extreme of the shoal extending southeast from Sejrö and that projecting westward from Ordrup Point.

If proceeding to the westward, and being south of the shoals on each side, Raklev Church in line with the chimney at Vröj, 221°, should be steered for, which will lead northwestward of the 2-fathom

patch south-southeast of Kolen, and when Vejrhöj is in line with the north point of Nexelö, 93°, steer 273°, using it as a stern mark.

If intending to anchor in Nexelö Bay, when southward of Kolen, Bregninge poorhouse should be brought in line with Havnsö Mill, south 2° east.

Anchorage.—According to the wind, good anchorage may be obtained off Overby, on the north side of Sejrö Bay, in depths of from 3 to 4 fathoms, with excellent holding ground; or on either side of Nexelö or in Nexelö Bay, in a depth of 4 fathoms.

Gniben, the northwest point of Cape Zealand (not to be confounded with Gniben, which is the northwest point of Sejrö) is about 60 feet high.

Albatros.—Off the western side of Cape Zealand for about 1¾ miles southward of Gniben, shoal water, with depths under 3 fathoms, extends for a distance of 1,200 yards, and westward of this is a narrow shoal, 1½ miles in length and parallel to the coast, with depths of from 2¼ to 3 fathoms over it.

Westward of the preceding shoal and about 1.6 miles from the coast is Albatros, a rocky patch, with a depth of 1½ fathoms over it; about 600 yards west and 1,000 yards north by west of the northern end of the narrow shoal just mentioned are two patches, with 3¾ and 4 fathoms over them, respectively.

Zealand Reef, which extends for a distance of 5 miles from Gniben, in a north-northwest direction, is made up of three parts, known as Inderrevet, Mellemrevet, and Yderrevet.

Inderrevet, a narrow ridge of rocks, with depths under 2 fathoms, extends in a northerly direction for 1.3 miles and is surrounded by a shoal flat, with depths under 3 fathoms, which extends about 1,600 yards from the northern part of the western side and about 600 yards from the east side, the southern part of that side being steep-to.

A channel 200 yards in breadth, with a depth of 2¼ fathoms over large rocks, is situated 400 yards inside the north end, and Baadelöb, another channel, but with 1¼ fathoms, is ½ a mile southward of the same point.

Snekkelöb, a channel 1⅜ miles in breadth, with a depth of 4 fathoms, separates Inderrevet from Mellemrevet; at its eastern entrance is a bar, on which are shoals of 1¾ and 2 fathoms.

Buoys.—A white can buoy, surmounted by a downturned broom. is moored in a depth of 2¾ fathoms, and marks the north end of Inderrevet and the south side of Snekkelöb.

A red conical buoy, surmounted by three upturned brooms, is moored in a depth of 4 fathoms, and marks the south end of Mellemrevet and the north side of Snekkelöb.

Mellemrevet, a rocky ridge 1 mile in length in a north-northwest direction, has depths of from 1 fathom to 1¾ fathoms over it.

Yderrevet (Rönnen), 3 miles in length in a similar direction to the preceding, its southern end lying westward of it, and separated by a small channel with a depth of 2 fathoms, is steep on its western side, but on the eastern are rocks with from 2 to 2¾ fathoms water over them. The 10-fathom contour line is about 1½ miles from the west and 1 mile from the west side of the reef.

The sea breaks on the reef in most moderate weather, and it may also be known by tide rips, which are always on the opposite side from which the tidal stream comes; consequently, with rising water and a southwest stream they will be on the west, and with falling water and a northeast stream on the east side.

Light.—A red beacon, 47 feet in height, with a white reservoir, and 500AL painted on four sides, is situated on the northwest point of Zealand Reef and exhibits, at an elevation of 46 feet above high water, an unwatched flashing white light, with a period of 15 seconds, showing a flash for 5 seconds. It is visible 8 miles.

Buoy.—A white can buoy, surmounted by two downturned brooms, is moored, in a depth of 5 fathoms, 1,200 yards northwest of the light beacon.

Refuge Beacon.—At 4 miles northwest of Gniben, on the highest part of Yderrevet, is a red tower, 23 feet high, surmounted by a gray house, and marked on four sides 500AL. It is supplied with provisions, there is a space for six or eight men, and a ladder is situated on the south side. In the event of it being required, there is a flag on the tower which can be hoisted on a pole mast as a signal for relief from the shore.

The mark 500AL signifies that no stones, clay, sand, gravel, or anything similar is allowed to be removed from any part of the bottom within a distance of 343 yards (500 alen) of either beacon.

Directions.—Snekkelöb can be used by vessels drawing less than 11 feet, and from the westward when Sejrby Church is midway between the mill north of it and a pointed hill eastward of the mill, bearing about 201°, a vessel will be near that entrance and may pass between the buoys, keeping slightly toward the one on the northern side. Or, if the mark can not be seen, the west side of the shoal westward of Inderrevet may be skirted by the lead, in a depth of 3 fathoms, and when the water deepens to 4 fathoms the vessel will be crossing the entrance, and the buoys should be seen.

The east approach being somewhat steep-to, the lead is no guide, and in thick weather the entrance is difficult to find. In thick weather small vessels round Zealand Reef by the lead, keeping in a greater depth than 8 fathoms.

Schultz's Ground, the shoalest part of which, with a depth of 1¾ fathoms, is situated 5 miles northward of Zealand Reef Light-beacon, is separated from it by a channel having depths of from 13 to 23 fathoms. Within the 5-fathom contour line the shoal is 3 miles in length in a northeast and opposite direction and has a patch of 3 fathoms near either end.

A bank with a depth of 6½ fathoms over it lies 1½ miles southwestward of the southwest end of Schultz's Ground.

Lightvessel.—A lightvessel, masted and painted in accordance with the Danish system (see Chapter I) and with "Schultz's Grund" on the sides, is moored in a depth of 15 fathoms about two-thirds of a mile south-southwest of the shoalest part of Schultz's Ground and exhibits at an elevation of 33 feet above sea level a group flashing white light visible 11 miles.

Fog signal.—A steam siren gives two blasts of two seconds' duration ever minute.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 4 fathoms close to the southward of the least depth on the shoal.

Clearing marks.—Ellemandsbjerg, in line with the south side of Hjelm, bearing 265°, leads south.

Ellemandsbjerg, in line with the north side of Hjelm, 262°, leads north in a depth of 4 fathoms.

Veirhöj in line with the east side of Gniben (Sjællands Odde), S. 6° E., leads east of the shoalest part in a depth of 4 fathoms.

Current.—The prevailing currents at Schultz's Ground Lightvessel are to the westward, with all winds from a westerly direction, frequently southwest with southwest winds and northwest with northwest winds; these westerly currents attain a velocity of 3½ knots.

Hastens Ground, 3 miles in length in a north-northeast and opposite direction, within the 5-fathom contour line, and nearly 1 mile in greatest width, consists of a number of patches, with depths under 3 fathoms, the least depth on it being 5 feet; the bottom over the whole shoal is gravel, but in some parts are rocks and fine sand. Its southern end is about ¼ mile northward of Schultz's Ground.

A patch of 2¾ fathoms lies northeastward of its northern end, with a bank of 1½ miles in length, and with depths of from 3¾ to 4½ fathoms, the northern end of which is fully 2 miles north-northeast of the north end of Hastens Ground.

Buoy.—A white can buoy, surmounted by three downturned brooms, is moored, in a depth of 6 fathoms, 1.3 miles northward of the shoalest spot.

Clearing mark.—In clear weather Aalsö Church, in line with Katholm, bearing about 294°, leads northward in a depth of 4½ fathoms.

Briseis Flat, the southern edge of which is 5½ miles northeastward of the north end of Hastens Ground, is, within the 5-fathom contour line, 2½ miles in length in a northeast and opposite direction; the least water over it, 2¼ fathoms, is nearly 1 mile from the northeast end.

Buoy.—A white can buoy, surmounted by two downturned brooms, is moored, in a depth of 5 fathoms, 1.8 miles southwestward of the least depth on the shoal.

Hesselö, about ¾ mile in length in a northwest and opposite direction, and situated 18 miles in an east-northeast direction from Gniben, is the smallest of the outlying islands of the Kattegat; its southeast point is short and low, but the northwest point is higher, and the island is 65 feet high, and without trees.

Light.—On the northeast side of Hesselö a cylindrical white tower, 79 feet in height, exhibits, at an elevation of 131 feet above high water, a group flashing white light, visible 17 miles.

Signal station.—Vessels can communicate by the International Code with a signal station at the lighthouse.

Dangers.—From the northwest point shoal water extends for a distance of about 1¼ miles, with a rock on it at ⅜ mile.

A shoal sandy spit 1 mile in length stretches in a southeast direction from the southeast point, and has depths on it of from ¼ fathom to 1½ fathoms; on the outer end of the latter depth is a rock, which breaks in strong winds.

A patch of 3 fathoms lies ½ mile northward of the lighthouse, and one of 4¾ fathoms about 1¼ miles in the same direction from the northwest point of the island.

Buoys.—A white can buoy, surmounted by three down-turned brooms, is moored, in from 6 to 8 fathoms water, off the end of the northwest shoal.

A red conical buoy, surmounted by an upturned broom, is moored, in a depth of 8¾ fathoms, at the end of the southeast spit.

Anchorage may be obtained on both sides of the island according to the direction of the wind, but not in a less depth than 7 fathoms, inside which the bottom is rocky.

Vessels passing the island should not approach it to a less depth than 11 fathoms.

Submarine telegraph cables.—A telegraph cable from the east end of the island connects with two cables to Anholt.

From the south side a cable crosses to about 2½ miles southwest of Kors Hook, in Zealand.

The first cables are marked by white telegraph poles, surmounted by triangles.

Lyse Ground, the southwest extreme of which lies 3¾ miles north-northeast of Hesselö Light Tower, from that extreme extends, within

the 5-fathom contour line, for a distance of 3¼ miles in a northeast direction, and is of irregular shape.

Inside its southwest end a shoal with a depth of 2 fathoms extends about 2 miles, and at the northeast end are two patches of 1 fathom and 1¼ fathoms; on the northern of these is the light beacon. From this a prong of the shoal stretches 1½ miles in a northwest direction, having a depth of 1 fathom near its extreme, and at the end, outside the 5-fathom contour line, are patches with from 1¼ to 3¾ fathoms water over them.

The bottom is generally sand, covered with seaweed, but in the lesser depths there are rocks.

Light.—On the shoalest and northeastern part of Lyse Ground a beacon consisting of a cylindrical base, 18 feet high and the same in diameter, with a red-iron post rising from the middle. surmounted by a white roof, exhibits. at an elevation of 45 feet above high water, an unwatched occulting white light, visible 10 miles.

Buoys.—A white can buoy, surmounted by one downturned broom, is moored, in a depth of 10¼ fathoms, northwestward of Lyse Ground.

Close to the southwest end of Lyse Ground is a white can buoy, surmounted by two downturned brooms; it is moored in a depth of 6 fathoms.

Lille Lyse Ground, 8½ miles northwest of Hesselö Lighthouse, is a small bank 1,400 yards in length in a northwest and southeast direction within the depths of 6 fathoms; the least water on it is 4¼ fathoms. A patch of 4 fathoms lies about 1 mile northward of it.

Between Lille Lyse Ground and Anholt there are depths of from 11 to 17 fathoms, and about the same between it and Hesselö.

Coast.—From Gniben the north coast of Cape Zealand curves to the southeastward and eastward, for a distance of 11 miles, to Klintebjerg, 115 feet high and steep; Lumbsaas mill, 9 miles from Gniben, stands on high ground, but eastward to Klintebjerg the land is low. Nyrup Bay is between Klintebjerg and Kors Hook a distance of 6½ miles, and on its coast Höjby, Nykjöbing, and Rösvig Churches are conspicuous. The whole is without wood.

Depths offshore.—Between Gniben and Klintebjerg shoal water, with depths under 3 fathoms, extends generally about ¼ mile, but in places to ½ mile.

A patch with a depth of 5¾ fathoms over it lies 2½ miles northward of Ebbelykke.

Odden Harbor, situated 3¾ miles southeast of Gniben, is a small harbor formed by a breakwater which extends about 270 feet in a north by east direction, and then turns east by south for about 400 feet; a short arm extends from the shore toward its east end, leaving an entrance between, facing eastward, 65 feet in width. The

depth in the approach is about 1¾ fathoms, and in the harbor from 1¼ to 1½ fathoms, but northerly winds raise and southerly winds lower the water.

Light.—From the end of the western breakwater a fixed green light is exhibited, at an elevation of 14 feet above high water, from a support 10 feet in height and painted black; it is shown from July 15 to June 1.

Communication.—The nearest railway station is at Höjby, and post, telegraph, and telephone offices at Overby, near Odden Village.

Supplies of fresh provisions and water may be procured.

Nyrup Bay has depths of from 3½ to 4¼ fathoms, but a shoal with less than 3 fathoms over it extends for 1¼ miles off its southwest side, and in the center of the bay is Skjærebæk Reef, which stretches for nearly 2½ miles in a northwest direction, with a breadth of about 1,600 yards, it has 2 patches of ½ fathom 1⅝ miles inside its extreme.

A rocky patch, with a depth of 2½ fathoms over it, is situated about 1,200 yards northeast of Klintebjerg. The shoals on the east side of the bay will be noticed when describing Ise Fiord.

Submarine telegraph cable.—From about 2½ miles southwest of Kors Hook a cable connects with Hesselö, its shore end being marked by two white telegraph posts surmounted by triangles.

Ise Fiord, the entrance to which, 2 miles in width, is between Kors Hook, on the west, and Spodsbjerg, on the east, opens out in a basin about 6½ miles square, and from the south side of this basin it stretches 9 miles to the southward, gradually narrowing from 4 miles to its head. Ourö, an island about 2½ miles in extent, lies in the entrance to this part, with channels on both sides of it.

The wider portion of the fiord, northward of Ourö, is known as Yder or Outer Bredning, and on the western side of this part, Nykjobing Bay extends about 2 miles northwest, and Lamme Fiord, about 4 miles in a westerly direction. Holbæk Fiord extends for a similar distance, and in the same direction from the western part of Indre or Inner Bredning, which is that part of the fiord southward of Ourö.

About 2½ miles southward of Spodsbjerg, on the eastern side of Ise Fiord, is the entrance to Roskilde Fiord, which, with an average breadth of 1 mile, has first an easterly direction for about 3 miles and then trends southward, parallel to Ise Fiord, for about 12 miles, where it terminates in a basin, about 3 miles in extent with several arms.

Light.—On Spodsbjerg, the east entrance point to Ise Fiord, a square white tower, 28 feet in height, exhibits, at an elevation of 130 feet above high water, a group flashing white light, visible 17 miles.

Grönne Ledge, a shoal with general depths of from 1¼ to 2¾ fathoms over it, extends in an east and west direction, for a distance

of 4 miles, and fronts the land about Kors Hook, from which point its northern edge is distant about 2¼ miles; at nearly half a mile northward of Kors Hook there is a rocky shoal, with ¾ fathom over it, and about ½ mile west-northwest of it are two others, with 1 fathom and less water.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored, in a depth of 3 fathoms, on the northern edge of Grönne Ledge and 2 miles north-northeast of Kors Hook.

Channel.—Small vessels, drawing less than 10 feet water, can cross Grönne Ledge between the shore bank extending from Kors Hook and a 4-foot patch by keeping Torup Church midway between Kik Harbor and the first house with a yellow gable, northward of that village, bearing about 89°.

Entrance.—From Kors Hook to Skanse Point, a distance of 1¾ miles, on the west side of the entrance, the land is low, sandy, and formed of downs, but from Spodsbjerg Lighthouse for about 2 miles, on the east side, the coast has some hills a short distance inland.

The entrance, 2 miles in width, except for a blind channel about 2 miles in length on the east side, is filled with shoal water, with a dredged channel through the west side and a shallow channel on the east. In the southern part of the blind channel on the east side is Sættereit Road.

Dangers.—The eastern edge of Gronne Ledge, from its northeast point, which is 2¼ miles northeast of Kors Hook, takes a southerly direction for 3½ miles, passing 1½ miles eastward of Skanse Point.

Spodsbjerg is fringed by a bank, with depths under 3 fathoms, which, westward of the inner entrance point on that side, has increased its distance from the shore to about 1,400 yards, leaving a channel between it and the edge of the shoal on the western side, about ½ mile in width at its entrance, contracting to half that distance farther in.

The above-mentioned channel, which has depths of from 3½ to 5 fathoms, only extends to a line joining the two inner entrance points, as here Lynæs sand, a shallow bar more than 1 mile in width, connects the shoal water from each side; on the western part of this bar are Trind Sand, Middel Ground, and Ave Sand, and westward of the latter another blind channel extends northeastward to Tærskelen.

Dredged channels—Depths.—The western or dredged channel, westward of Tærskelen, has depths of from 1¾ to 2 fathoms, and northeast of Tærskelen the depth is slightly less; southward of the same shoal the channel has from 5 to 7 fathoms water.[1]

Beacons.—Two wooden beacons, surmounted by triangles, and situated near Rorvig, are for use in leading through the western

[1] A shoal of 1¾ fathoms existed in the fairway of the dredged channel in 1910.

channel, and a pole beacon, surmounted ty two triangles, stands southward of the town.

Buoys.—The western side of the dredged channel is marked by four red spar buoys, the outer surmounted by two upturned brooms, the remainder by one upturned broom. The eastern side of the same channel is marked by two white spar buoys, each surmounted by a straw wisp.

Oster Channel.—The Oster Channel, through Sætteriet Road and across the western part of Lynæs Sand, is considerably broader than the Vester Channel, but has only a depth of 1½ fathoms.

Buoys.—The western edge of the shoal water at the southern part of Sætteriet Road is marked by a white spar buoy, surmounted by a straw wisp.

The west side of the shoal ground of Lynæs sand is marked by a white spar buoy, surmounted by a straw wisp.

The southwest side of the same shoal is marked by a spar buoy, painted red and white in bands, and surmounted by a ball.

Anchorage.—The anchorage in Sætteriet Road is in depths of from 2¼ to 3 fathoms, over sand and good holding ground, with Kulhus Mill open southward of Lynæs Harbor, bearing 108°. Winds between northwest and northeast send in some sea, but it is broken by the outlying shoals, so that vessels can ride out northerly gales.

Hundsted Harbor, on the east side of the entrance, about ¾ mile southward of Spodsbjerg, consists of a double jetty, about 350 feet in length, in a westerly direction, at the end of which are two curved breakwaters, each about 650 feet in length, which inclose an outer and an inner basin, almost circular, the outer being about 160 and the inner about 260 feet in diameter; the entrances to both are about 60 feet in width.

The depths in the entrance are 1½ feet; in the outer harbor 1½ fathoms, and in the inner harbor 1½ fathoms, but the in-going stream to the fiord raises the water, and northwest winds raise it 4 feet, while those from the southward lower it 3 feet. There is a patent slip with lifting power of 20 tons.

Lights.—On the end of the north breakwater a fixed red light is exhibited, at an elevation of 16 feet above high water, from a pole 10 feet in height and painted white.

From a white house 10 feet in height, situated on the north side of the entrance to the inner basin, a fixed white light is shown at an elevation of 16 feet above high water.

From red poles 8 feet and 23 feet in height are exhibited, 13 and 26 feet, respectively, above high water two red lights. These are leading lights and on line of bearing 70° lead through harbor entrance.

Pilots may be obtained at Hundsted and at Rorvig, and will come out on the usual signal being made; those from the former place take vessels to Rorvig, and through the Oster Channel to Yder Bredning. Those taken from Rorvig pilot vessels to places in the fiord.

Directions.—Spodsbjerg and the lighthouse are a guide to the entrance, and if from the westward Grönne Ledge should be given a good berth, and not approached within a depth of 5 fathoms until the buoy is sighted; in rounding into the fiord the lead should be a good guide, on the west side but on the east side the shore bank is steep-to.

Spodsbjerg lighthouse, in line with the westernmost house near Hundsted Harbor, bearing about 24°, as a stern mark, leads to Sætteriet Road, and through Öster Channel to the striped buoy, surmounted by a ball, southwest of Lynæs Sand.

By night.—Spodsbjerg and Hundsted Harbor lights, in line 24° lead through Öster Channel.

Vester Channel.—Vessels whose draft will not allow them to use the Öster Channel pass into the fiord through the dredged channel in depths of from 1¾ to 2 fathoms, or in a depth of 1½ fathoms, over Tærskelen, the mark for the latter being the beacons with triangular topmarks at Rörvig, in line about 248°.

The beacons in line lead southward of the buoy eastward of Tærskelen, and when Egebjerg Church is in line with Mortens Knot, a conspicuous high mark on Nakke Head, they are steered for, and the course is then more to the southward till the church is in line with Nakke Head; but all the marks given are not shown on the chart, and a vessel would probably employ a pilot.

West shore of the fiord.—From Skanse Point the west coast trends to the southwest for about 1 mile to Rörvig; Rörvig Church, 1 mile inland, and the mill south of the town, the Customhouse, painted red, with a tiled roof, and a flagstaff, and Rörvig Beacons, are conspicuous marks.

Rörvig, nearly 1 mile westward of Skanse Point, has a pier extending for a distance of 650 feet in a southeast direction, with an L head to the northeast and shorter piers extending from the head on each side of it. There is a depth of about 1¾ fathoms at the pierhead, but gales between west and north raise the water 2 feet, and those from southeast to south lower it by the same amount.

Pilots may be obtained for Frederikssund and other places in the fiord.

Tides.—It is high water, full and change, at Rörvig at 11h. 32m. The ordinary rise is about 1 foot.

Communication.—There is a telegraph office, but the railway and post are Nykjöbing, about 4 miles distant. Rörvig village had a population of 404 in 1906.

Supplies.—Some fresh provisions may be procured, and water obtained.

Nykjöbing Bay.—From Rörvig the coast trends to the southward for 2½ miles, to Nakke Head, and then west-northwest for nearly 3 miles, forming the northern side of Nykjöbing Bay. It then turns to the southward of 2½ miles on the west side of that bay. Nykjöbing Bay is filled with shoals, with depths under 3 fathoms, almost to the line joining its entrance points.

Ringholm, projecting from the north side of the bay, has a conspicuous country house on it, and on the west side of the bay are Grönne Harbor and Annebjerg Woods; Annebjerg Mansion House also stands close to the shore.

Nykjöbing Harbor consists of a quay, on the eastern side of which is a breakwater, about 850 feet in length, curving from southeast round to south-southwest, with an entrance facing south-southwest between its head and the quay, about 100 feet in width.

The depth in the entrance is 2 fathoms, and in the harbor from 1¾ to 2 fathoms. In the bay the general depths are from 2 to 3 fathoms, the bottom being mud and clay. There is a regular flood and ebb tide, and northwest gales also raise the level of the water and southeast gales lower it 3½ feet. Three warping buoys are situated outside the harbor.

Light.—From the head of the West Mole, from a gray post 20 feet high, there is shown, at a height of 26 feet above high water, a fixed red light.

Dangers.—Rönnen, on the north side of the bay, extends about 600 yards offshore, with a depth of 1 foot, and a shoal of 2¾ fathoms stretches 400 yards southward of it; it is steep-to.

Shoal water, with depths under 3 fathoms, extends about ¾ mile southward of Ringholm, and on the west side of the bay Göje Reef, about ¼ mile offshore, has a depth of ½ fathom.

Buoy.—Rönnen is marked on its south side by a red spar buoy, surmounted by an upturned broom.

Directions.—Troldebjerg or Syvhöje, well open south of Grönne Harbor, bearing about 302°, leads southward of Rönnen, and when Nykjöbing Church is in line with the harbor entrance, north, it will lead to the harbor.

By night the leading lights are in line on the latter bearing.

Anchorage.—The bay affords good anchorage and holding ground in a depth of 3 fathoms, with Troldebjerg in line with a storehouse,

near Annebjerg Mansion House, bearing about 304°, but winds from southeast to south-southeast send in some sea.

Town.—The town had a population of 1,989 in 1910.

Communication.—There is a railway to Holbæk, and a post and a telegraph office in the town, which is connected with the harbor by a tramway.

Coal and supplies.—Some coal might be obtained, and there is a coaling quay alongside the breakwater, for vessels under 200 tons; fresh provisions may be procured and water from the town waterworks.

Coast.—From the southwest part of Nykjöbing Bay the coast trends in a south-southeast direction with a curve to the south-southwest, for 5 miles to Kongsöre Point, on the north side of the entrance to Lamme Fiord; on this stretch of coast Ulkerup, Stokkebjerg, and Kongöre Woods are conspicuous, and also Egebjerg church and mill, 174 feet high, with Holkerup mill southeast of them.

Depths offshore.—From abreast Bosserup to opposite Stokkebjerg the shoal water, with depths under 3 fathoms, extends about ½ mile off, but otherwise the shore bank is about ¼ mile offshore.

Lyse Ground, lying 1 mile offshore abreast of Kongsöre Wood, is about 1.1 miles in length in a north and south direction, with depths of from 1¾ to 2½ fathoms.

Buoy.—A white spar buoy, surmounted by a straw wisp, is moored in a depth of 2 fathoms, westward of a depth of 1¾ fathoms, near the southern part of the shoal.

Lamme Fiord, entered between Kongsöre Point and Svolsbjerg, about ¾ mile southward of it, extends in a west-southwest direction for 4 miles, beyond which it is in course of reclamation; this latter part extends westward to within nearly 1 mile of Nexelö Bay.

On the northwest side of the fiord, Sidinge Fiord extends for about 2 miles in a northwest direction, with a breadth of 1,200 yards; nearly 3 miles of this fiord have been reclaimed.

The land on both sides of the fiord is high, especially on the south, where are most of the conspicuous objects. Near the south side of the dam at the head of the fiord are two chimneys, and three wind motors, and further west Kundby and Horve churches and Snertinge mill are conspicuous.

Depths.—The depths at the entrance are 5 fathoms, and in the channel of the fiord to the dam from 3½ to 7 fathoms.

Dangers.—Kongsöre Point, which has a solitary house at its outer end, is nearly steep-to, but westward of it, on the north side of the fiord. Egenæs Hook extends for 1⅓ miles in an easterly direction, with Rönnen Rock on its inner part, and depths of from 1 foot to ½ fathom for about 1 mile; the northwest side of the fiord, after pass-

ing this, has shoal water, with depths under 3 fathoms ⅝ mile offshore.

Svovlsbjerg Reef, with a depth of 1½ fathoms, extends about 1,200 yards northeastward of Svovlsbjerg, and on the southeast side of the fiord the shoal water is generally about ¼ mile off; Kisserup Hook, a rock opposite Egenæs Hook, is 600 yards offshore.

Buoy.—A red spar buoy, surmounted by an upturned broom, is moored in a depth of 2½ fathoms on the northeast side of Svovlsbjerg Reef.

Piers.—Near Sidinge a pier has a depth of 1¼ fathoms, and near Avdebo another has 1¾ fathoms alongside.

Directions.—From the northward Kongsöre Point may be passed fairly close, and the channel up the fiord, about 600 yards wide, lies toward the southern side; leads northeast of Svovlsbjerg Reef, Anchorage may be obtained anywhere in depths as convenient.

Eastern shore.—From Kulhus Point, the southern side of the entrance to Roskilde Fiord, the eastern shore trends in a southerly direction for 5 miles and then bends round to the westward for about 4 miles.

This coast is wooded in places, Nordskov and Jægersprus-Slothegn being large.

Depths offshore.—From Kulhus Point a shoal, on which is Alholm, a small island, extends in a south by west direction for about 2 miles, but the shore bank from the coast to the southward is only from 400 to 600 yards in breadth, except at Jægersprus Bay, where it is about ½ mile.

Gunnery practice.—Night gunnery practice occasionally takes place in Ise Fiord, the firing being from Nykjöbing Bay toward Jægersprus. When firing is taking place the fire zone will be marked by electric searchlights.

Ourö, which occupies the mouth of Inner Bredning, is 3½ miles in length, in a north and south direction, and highest at its southern part; Bybjerg Church and Mill, on the southwest part of the island, are conspicuous.

West shore of the fiord.—From Svovlsbjerg to the northern entrance point of Holbæk Fiord, the coast trends, in a southerly direction, for nearly 3½ miles, and nearly midway a wooded point of land named Hönsehalsen projects to the southward, with a bay mostly dry inside it. The most conspicuous object on this part of the fiord is Kisserup Mill.

Holbæk Fiord is entered between a point at Bognæs, on the north, and Kirsebær Point, the north end of Kirsebærholm, which is connected to the coast to the southward by a narrow isthmus; a redoubt stands on Kirsebærholm.

From its entrance the fiord extends for a distance of 4½ miles to the westward, and on the north side are Hörby Ferryhouse and Church; at the head Tudse and Kundby Churches, and midway on the south side Holbæk Harbor, with Dragerup Wood eastward of it.

Depths.—A channel extending for about 1 mile into the middle of the entrance has depths of from 4 to 7 fathoms, but the general depths in the fiord inside it are from 1½ to 2¼ fathoms.

Holbæk Harbor, on the south side of the fiord, consists of two small basins, the eastern or boat harbor, about 350 feet, and the western about 420 feet in an east and west direction, with a width of about 250 feet, the entrance to the former being about 35 feet, and that to the latter 100 feet in breadth.

The depth in the approach to and in the harbor is 2 fathoms, and to and in the boat harbor 1¼ fathoms, but gales from west, through north, to northeast, may raise the water 4 feet, while those from east, through south, to southwest, may lower it by the same amount.

Lights.—On the western side of the boat harbor a fixed red lantern light is exhibited at an elevation of 10 feet, and from the same side of the harbor a fixed green light is shown at 16 feet; these, shown from gibbets, are lighted from September 1 to June 1.

Dangers.—Shoal water, with depths under 3 fathoms, extends about 600 yards southward of Bognæs, and from Kirsebær Point a similar shoal extends in a northeast direction for ½ mile.

Buoys.—The shoal water off Bognæs is marked on its southern edge by two red spar buoys, surmounted by upturned brooms.

Kirsebær Point is marked by a white spar buoy, surmounted by a straw wisp.

An additional spar buoy with broom has been placed on the north side of the entrance channel about 1,700 yards southwestward of Bognæs, and a similar buoy on the south extreme of the shoal extending from the north shore of the fiord opposite the town of Holbæk.

Two additional white spar buoys, with straw wisp as top mark, have been established on the southern side of the entrance channel, and a similar buoy on the northern extreme of the bank extending from the south shore of the fiord about midway between Kirsebær Point and Holbæk.

Directions.—The south side of Allinge Mountain, on the east side of the fiord in line with a wooded slope on the south point of Ourö, bearing about 65°, used as a stern mark, leads between the shoals on either side, in a depth of 2¼ fathoms.

Anchorage may be obtained all over the fiord; in the deeper water the bottom is mud, but in shallow water and near the head of the fiord it is covered with seaweed.

Tides.—It is high water, full and change, in Holbæk at 0h. 44m.; the ordinary rise of tide is 2 feet.

Town.—Holbæk is a town with a population of 5,526 in 1908.

Communication.—Small steamers ply to the various places in Ise Fiord and to Aurö, and there is a ferry across the fiord to Hörby. Railway communication with Nykjöbing and with Kallundborg, also with Roskilde; post and telegraph offices in the town.

Coal.—A considerable amount of coal can be stocked, and water is laid on the harbor from the town waterworks.

Inner Bredning, a triangular-shaped area, about 2 miles in length, and from ½ mile to 1½ miles in width, with depths of from 3¼ to 4 fathoms, is situated about 2 miles southward of Ourö, the space between being filled by islets, rocks, and shoals, best seen on the chart; it is the head of Ise Fiord, except Brmsnæs Creek, narrow and shallow, which extends for a further distance of 2 miles.

Ourö West Channel.—There is a channel on each side of Ourö to Inner Bredning, that on the west side being the wider and deeper of the two. The narrowest part of the West Channel, which lies between shoals extending from each side, is between Hönsehalsen and Bybjerg.

Depths.—The depths in West Channel are from 3½ to 9 fathoms.

Buoys.—A red spar buoy, surmounted by an upturned broom, is moored on the eastern edge of the shoal extending from Hönsehalsen.

The edge of the shoal extending from Ourö is marked by two white spar buoys, surmounted by a straw wisp, the outer being on the edge of a shoal named Skinkelmæren, and the other on a detached shoal south-southwest of Ourö.

A white spar buoy, surmounted by a straw wisp, also marks the south extreme of Dronninge Dyssen, the southernmost danger extending from Ourö.

These buoys are all in a depth of 2 fathoms.

Directions.—Although West Channel is narrow, there are no charted dangers in it, with the exception of three shoals lying fully a mile south-southwest of Lindholm, but the leading marks given for it can not be followed from the chart, and the services of a pilot would probably be necessary.

Ourö East Channel.—Næsby Reef extends for a distance of about 1,400 yards northward of the north point of Ourö, and has depths of less than 1 fathom for about 800 yards, the remainder having less than 3 fathoms water over it.

Kyndby Reef extends for a distance of nearly 2 miles from the coast on the eastern side of East Channel and is parallel to Næsby Reef; it has islets, rocks, and depths under 1 fathom for nearly 1½

miles, the remainder of the reef having depths of from 2 to 2½ fathoms.

East Channel, entered between the north points of these two reefs, is about 400 yards in breadth, but narrows farther in to about 60 yards; it has a least depth of 1¼ fathoms.

Anchorage may be obtained all over Inner Bredning, avoiding the shoals.

Training stations—Piers.—On the west shore of Inner Bredning, near Dragerup Wood, and in Bramsnæs Creek on the eastern side of a small wooded peninsula, at the head of the fiord, are training stations for seamen, and there are piers for the use of these establishments.

Marks are set up on shore, and an area used for gun practice is marked by barrel and green spar buoys, surmounted by cones; vessels should not enter these areas.

Anchorage in a depth of 2½ fathoms may be obtained off the pier at Bramsnæs, but the holding ground is not good.

Submarine telegraph cable.—A telegraph cable crosses West Channel from Dragerup to the ferry house on the southwest side of Ourö; it is marked, on the island side, by the telegraph beacons (see Chapter I).

Lynæs Harbor, situated on the north side of the outer part of the entrance to Roskilde Fiord, is formed by two breakwaters parallel to each other in a southeast direction, and 180 feet apart; the western is about 600, and the eastern 500 feet in length, the ends curving toward each other, leaving an entrance between them, open eastward, and 60 feet in width.

The depth in the entrance is 1½ fathoms, and from 2¼ to 1½ fathoms inside, but the in-going stream into the fiord raises the water.

Light.—A fixed white light is exhibited from a square white house, 6 feet in height, on the west breakwater head, at an elevation of 15 feet above high water when the harbor is open.

Tug.—A tug is available.

Tidal streams.—In settled weather the tidal streams change regularly.

Communication.—The post and telegraph offices are at Lynæs, but the nearest railway is at Frederiksværk, distant 6 miles.

Coal and supplies.—Some coal is stocked and fresh provisions may be procured at Lynæs Town; water can be obtained near the harbor.

Repairs.—There is a machine workshop.

Roskilde Fiord, between the south side of the promontory which forms the east side of the entrance to Ise Fiord on the north and Kulhus Point on the south, is there about ½ mile in width, from

which it opens out into a triangular-shaped area, the sides of which are each about 4 miles in length. Frederiksværk is situated at the northeast point of this triangle.

From 4 miles east by south of Kulhus Point the fiord trends to the southward for about 10½ miles, with an average breadth of 2 miles, and then opens out to a basin about 3 miles in extent and having several arms.

Frederikssund is situated 8 miles southward of Frederiksværk, on the east side of the fiord, and Roskilde is at the head of the southeast arm, 11 miles farther south.

Depths.—The entrance between the shore banks on each side is narrow, but has depths of from 6 to 9 fathoms, but inside the shoal on the south side increases its distance from the shore to more than a mile, and shoal water extends across to Frederiksværk.

The shoals in the fiord will be best seen on the chart, and the depths in the channel northward of Frederikssund are nearly 2 fathoms, while to the southward of that town they are 1¾ fathoms.

Frederiksværk Harbor, about 100 yards in extent, is inclosed by two breakwaters, each about 350 feet in length, the western having a south by west, and the eastern a west by north direction; the entrance between their heads, about 60 feet in width, faces southwest by south.

The depth in the entrance and dredged channel leading to it is about 1½ fathoms, and in the harbor about 1¾ fathoms, but winds from west-northwest raise the water about 3 feet, and those from southeast lower it about 2½ feet.

Town.—The town of Frederiksværk, with a population of 1,743 in 1908, is situated ½ mile from the harbor.

Communication.—A railway runs across the island to Suekkersten and southward from it to Copenhagen. The post, telegraph, and telephone offices are in the town; the last office is connected with Hundsted.

Supplies of fresh provisions may be obtained from the town, the water being from the waterworks.

Repairs.—Some small repairs might be executed at a workshop in the town.

Frederikssund, on the east side of the fiord, about 8 miles southward of Frederiksværk consists of an old and new harbor and also a boat harbor; the new harbor about 100 yards in length, 50 yards in width, being approached by a dredged channel, northward of Kronprins Frederikes Bridge.

The depth of the dredged channel is 1¾ fathoms, and the same in the new and in the old harbor, and 4 feet in the boat harbor, but winds from west to north raise and those from the southward lower the water about 2 feet. There are three warping buoys.

Light.—A fixed red light is exhibited from a post 10 feet in height on the pierhead of the harbor at an elevation of 15 feet above high water, between September 1 and May 1, until 11 p. m. At the opening of Kronprins Frederikes Bridge, fixed red and green lights are shown when a vessel is passing through.

Pilots for Roskilde may be obtained.

Tides.—It is high water, full and change, in Frederikssund at 2h. 12m., the ordinary rise of tide being somewhat less than 1 foot.

Town.—The town of Frederikssund had a population of 2,410 in 1910.

Communication.—A railway connects Frederikssund and Copenhagen, and there are post and telegraph offices in the town.

Coal and supplies.—Some coal might be obtained, and fresh provisions and good water procured in the town.

Jyllinge Harbor, about 5 miles south of Frederikssund, is about 60 yards by 35 yards, and has a depth of 4 feet. There is a railway station, a post, and a telegraph office at Olstykke, 1 mile distant, and a telephone office at the harbor.

Fresh provisions and water may be procured.

Roskilde Harbor is formed by two small breakwaters extending in a northerly direction and bending toward each other at their heads, with an entrance 65 feet in width facing northeast by north; the harbor is 70 yards in extent.

The depth in the entrance is 2 fathoms, and about $1\frac{3}{4}$ fathoms in the harbor, but winds from north and west raise, and those from south and east lower, the water 2 feet. A tug is available, and will tow vessel as far as Frederikssund.

The town of Roskilde, the capital of the kingdom until 1443, is about $\frac{1}{2}$ mile from the harbor, and had a population of 8,987 in 1908; the cathedral, consecrated in 1084, was the burial church of the Danish kings till 1906.

Communication.—Roskilde is an important railway center, and railways run to Copenhagen, to Holbæk, to Kjöge, and to Korsör; the station, post and telegraph offices being in the town.

Coal and supplies.—About 1,000 tons of coal can be stocked, and fresh provisions and water may be obtained in the town and about $\frac{1}{2}$ mile from the harbor, respectively.

Piers.—There are several piers in Roskilde Fiord, and if known, the lengths, with depths alongside, are given below:

Kulhus.—Depth at outer end 9 feet.

Dyrnæs.—A pier of brick, 1,440 feet in length, furnished with a tramway, and a depth of $7\frac{1}{4}$ feet at its head.

Torp-Ladegaards.—A stone pier with $3\frac{1}{4}$ feet water at its end.

Östskov, westward of Eskildsö, a stone pier with a depth of 9 feet at its head.

Gjershöj.—A pier with 7¼ feet water at its head.

Kattinge Works.—A pier 100 feet in length with a head 80 feet in length and 20 feet in breadth, belonging to the Kattinge Cellulose Works; it is furnished with a tramway, and a channel 130 yards in length, with a depth of 10 feet, leads to it, the depth at the pierhead being the same. The channel is marked by perches and has warping buoys on each side and one westward of it.

Boserup, off Boserup Wood, has a pier 100 feet long for boats.

Lyngby, 1 mile northward of Lyngby Church, a pier 300 feet in length, with a depth of 6¼ feet at its head.

Tidal streams.—The tidal streams in Ise Fiord are regular, with settled conditions, but with unsettled weather they may run for 18 hours, or even more, in one direction.

Gales from north or south drive a large quantity of water in or out of the fiord, and the in-going stream, making about 4 miles eastward of the entrance, sets southwest by south through East Channel and northeast by east through Kulhus Channel at the entrance to Roskilde Fiord.

The stream through West Channel runs along the coast, a part setting from Rörvig over the sands toward Öster Löb.

The outgoing stream from Roskilde Fiord, through Kulhus Channel, sets in a northeast by north direction, round Lyænes Sand, toward Spodsbjerg, and over Grönne Ledge, where it has an easterly direction.

The other part of the stream, from East Channel, sets over Middle Ground and follows the channel near Rörvig, over the sands and along the coast seaward.

Current.—From Zealand Reef a strong east-going current sometimes sets southward of Hesselö, and uniting with the current from Ise Fiord, sets along the coast as far as Nakke Head, where one branch sets to Ellekilde Hook and another to Svinbådan.

Coast.—From Spodsbjerg the coast trends in an northeast by east direction for 8½ miles to Tisvilde fishing village, from which no abreast Blidstrup, a distance of 4 miles in the same direction, it has steep cliffs; it then trends more to the eastward for 3½ miles to Gilbjerg Head, 109 feet high, but is low between.

The conspicuous objects on this coast are Kikhavn fishing village, Torup and Melby Churches, Tisvilde Hegn, a large wood, and the fishing village of the same name, Tibirke Church, Salgaardshöj 161 feet high, close to the coast, Raageleje fishing village, and Vejby and Blidstrup Churches.

Depths offshore.—On the whole stretch of this coast the 3-fathom contour line is not more than ½ mile from it, but from abreast of Torup Church to northwestward of Tisvilde fishing village the 5-fathom contour line extends about 2 miles off, and

about 3 miles northward of Torup Church, is Torup Flat, a small patch, which has from 2¾ to 3 fathoms, and foul ground between it and the shore; a patch of 2¾ fathoms lies 1 mile northward of Kikhavn Village.

Between Tisvilde Village and Salgaardshöj, the 5-fathom contour line is little more than ½ mile from the coast, but nearly 1¼ miles northward of the latter is Bagerovnen, a shoal with a depth of 2¾ fathoms, from which the 5-fathom contour line commences to draw off the coast, and is nearly 1¼ miles north-northeast of Gilbjerg Head.

Gunnery practice.—Gunnery practice takes place annually from a position near Tisvilde Village. At the time of practice the ground is marked by three buoys, each carrying a red and white horizontally striped flag, moored about 1½ miles from the coast and 1,300 yards apart. One hour before practice red flags with white horizontal stripes are hoisted at flagstaffs situated about 800 yards in from the coast near Liseleje and the same distance inland near Tisvilde Hegn; these flags are hauled down on the conclusion of the firing. Vessels are warned that it is dangerous to enter the area inside the buoys when the above flags are hoisted.

Pier.—Close to the westward of Tisvilde is a pier with a depth of 3 feet.

Gilbjerg Head is a steep, bare cliff, 109 feet high, with a conspicuous house eastward of it. See also Chapter V.

Gilleleje Flat extends in a shoal tongue in a northerly direction from the coast eastward of Gilbjerg Head, its extreme being 2¼ miles north by east of that point; there are depths of from 3½ to 3¾ fathoms on its outer part, and several shoals lie between it and Gilleleie, which will be found described in Chapter V.

Light and whistle buoy.—A red buoy, marked "Gilleleie flak, N." and exhibiting an occulting white light, with a period of one-eighth of a minute, showing light for five seconds and eclipse two and a half seconds, is moored 500 yards northeast of the depth of 3¾ fathoms on Gilleleie Flat; the buoy is also fitted with a whistle.

For the coast eastward see Chapter V.

Islands in the Kattegat.—The small islands lying off the north coast of Zealand have been already given, and the large islands of Læsö and Anholt, with the various banks, and the channels, which constitute the approach to The Belts and The Sound, will now be described.

Læsö, the northern and larger of these islands, lying about 10 miles off the coast of Jutland and 28 miles southward of The Skaw, is 11½ miles in length in an east and west direction, with a greatest width of 5½ miles; being comparatively low and surrounded by reefs

and shoals, it is dangerous. In 1906 the population of the island was 2,969.

North coast.—The north coast of Læsö, which is the highest part, trends northeast from the west point of the island for 3½ miles to Holtemmen, the northwest point, then turns eastward for nearly 9 miles to Syr Point, the northeast end of the island.

Vesterö town and church, the latter with a red square tower, is about 1 mile from the west point, and from Vesterö Harbor the coast is chiefly sandhills, of which Höjsande, about midway, is 102 feet, and the highest, Jegenshöj, 1½ miles westward of, and Danzigmand, close-to, Syr Point, are 30 and 36 feet high, respectively. Byrum Church, red, with a steeple, 99 feet high, rising from trees, is nearer the south coast, but may be seen from this side of the island.

Vesterö or Lundbæk Harbor, 3 miles from the west point of Læso, consists of an outer and an inner harbor, formed by a west breakwater extending about 560 feet in a northerly direction and a north breakwater about the same length in a west-northwest direction, curving to the southward; a similar but shorter arm almost parallel to the latter forms the inner harbor. The entrances to the outer and inner harbors facing north are about 100 and 60 feet in width, respectively.

The depths in the entrance and in the harbor are from 1¼ to 1¾ fathoms, but gales from northwest raise the water 4 feet, and those between east and south lower it 3 feet. A warping buoy is moored outside the harbor.

Light.—On the west breakwater head a post, 23 feet in height, situated near a small white house, exhibits, at an elevation of 21 feet above high water, a fixed green light with a red sector.

Buoy.—A rock, with a depth of 5 feet over it, on the western side of the entrance to Vesterö Harbor, is marked by a red spar buoy surmounted by an upturned broom.

Warping buoy.—A warping buoy is moored outside the harbor.

Pilots for the coast of Jutland and for the Sound and Great and Little Belts can be obtained.

Tides.—It is high water, full and change, in Vesterö Harbor at 6h. 10m.; the ordinary difference between high and low water is 2 feet.

Communication.—The post and telegraph offices are at Byrum, but a telephone at the harbor is connected with that town.

Supplies.—Fresh provisions con be obtained, and water from a well near the harbor.

Life-saving station.—A lifeboat and a rocket apparatus are maintained at Vesterö.

North Rönner.—From the northwest point of the island a sand spit, fully 4 miles in length and ½ mile in breadth, extends in a northerly direction, curving somewhat to the eastward, and near its extreme are Langholm and Spirholm, two large islets, with two smaller ones named Store and Lille Stenholm; all are grass covered.

Dammen is a small boat harbor, with a depth of 4 feet, formed by the islets, and there are other rocks awash on the spit, while from its west side a dry reef named Borfeld extends about 1 mile in a north-northwest direction, with 1½ fathoms near its end.

A shoal spit, with from 1½ to 3 fathoms water over it, extends for 1¼ miles in a northerly direction from Spirholm.

Lights.—On Spirholm a cylindrical tower of granite, 59 feet in height, exhibits, at an elevation of 52 feet above high water, an alternating white and red light, visible 12 miles.

Two fixed green leading lights are shown in February, March, and from August to November; also at other times when steam vessels are expected; they are in line, bearing 198°, and 130 yards apart.

Buoys.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 6 fathoms northwest of Borfeld.

A white can buoy, surmounted by one down-turned broom, is moored in 5 fathoms water at the northeast extreme of North Rönner.

Telephone cable.—A submarine telephone cable connects the northwest point of Læsö with Langholm.

Hornex Point—Dangers.—Hornex Point is situated 3½ miles eastward of Vesterö, and from it shoal water extends for a distance of ¾ mile in a northwest, and 1 mile in a north-northeast direction, terminating, in the latter case, in Phönix Ground, on which the depth is 1 fathom.

Southwestward of a line joining Phönix Ground and the northeast extreme of North Rönner are numerous shoals, best seen on the chart. About ½ mile and 1 mile eastward of Phönix Ground are two shoals, with 2¾ and 2¼ fathoms water, respectively.

Lifeboat.—A lifeboat is stationed at Hornex Point.

Österby Harbor, 2¾ miles eastward of Hornex Point is formed by a western breakwater, about 500 feet, in a north-northeast direction, and one on the eastern side, about 360 feet, in a northwest direction, the entrance between their heads being 60 feet in width.

The depths in the entrance and in the harbor are 1¼ fathoms, and at the small center pier about 6 feet, but westerly winds raise the water about 2 feet, and those from the eastward lower it about the same.

Light.—On the west breakwater head an unwatched fixed light, with white, red, and green sectors, is exhibited, at an elevtion of 23 feet above high water, from a white post, 17 feet in height; it is not

shown when Læsö Trindel Lightvessel is withdrawn. For bearings of sectors, see Light List.

Life-saving station.—A lifeboat and a rocket apparatus are maintained at Österby, the station being in the bay on the south side of the island.

Communication.—The village is about 1 mile from the harbor, and there are a post, telegraph, and telephone office.

Supplies of fresh provisions and water can be obtained from Österby.

Slip.—There is a patent slip with lifting power of 35 tons.

Læsö Northeast Flat.—A shoal, with a depth of 1½ fathoms, lies about ½ mile northeastward of Österby Harbor and northward of it commences an extensive bank which stretches northward for fully 1 mile, and extends eastward for about 3 miles, being about the former distance northeast of Syr Point.

From its northern side a narrow prong extends in a north by east direction for a distance of 3 miles offshore. Engelskmands Bank, rocky, and with 2¼ fathoms over it, is the western part of this bank; Rusmands Bank, with a depth of 1¾ fathoms, is the inner part of the prong; and Tællemands Bank, with a depth of 1 fathom, is on the eastern side, and nearly 1 mile northeast of Syr Point.

A shoal of 1¾ fathoms lies ¾ mile eastward of Syr Point, and the 5-fathom contour line is about 3½ miles in the same direction from that point.

Beacon.—About ¾ mile south of Syr Point, and close to the beach, is a pole beacon, 30 feet in height, and surmounted by a ball.

Buoys.—The northeast extreme of Læsö Northeast Flat is marked by a red conical buoy, surmounted by three upturned brooms; it is moored in 5 fathoms.

A white spar buoy, surmounted by a straw wisp, is moored in a depth of 4¼ fathoms west of the extreme of Engelskmands Bank.

A red conical buoy, surmounted by two upturned brooms, is moored in a depth of 6 fathoms 2 miles northeast of Syr Point.

Læsö Trindel.—Tönneberg Bank is the north extreme of an extensive flat, within the 10-fathom contour line, which extends 5 miles westward and 8½ miles northward of the island, the bank being 10 miles north-northeast of Syr Point. Læsö Trindel, about 4 miles southward of the north extreme of Tönneberg, is a small rocky shoal, with a depth of ¾ fathom over it, and 4 fathoms close-to, and is the northernmost danger in this part of the Kattegat.

A bank about 2 miles in length in a north and south direction, and with depths of from 4½ to 5 fathoms over it, lies about 3 miles westward, and a patch with 4¾ fathoms water over it, is about 1 mile east by south of Læsö Trindel.

Lightvessel.—A lightvessel, masted and painted according to the Danish system (see Chapter I), with "Læsö Trindel" on the sides, is moored in a depth of 11 fathoms, about 1½ miles northeast of Læsö Trindel, and exhibits, at an elevation of 33 feet above sea level, a flashing white light visible 11 miles.

Fog signal.—During foggy or thick weather a siren gives two blasts each of two seconds duration, in quick succession, every minute.

Buoys.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 6 fathoms ⅝ mile westward of Læsö Trindel.

A red conical buoy, surmounted by an upturned broom, is moored on the southeastern edge of Læsö Trindel.

Currents.—When in the vicinity of Læsö Trindel no confidence should be placed on an assumption that with westerly winds an easterly current is to be invariably expected, as from the result of observations already given, the currents frequently set against the wind, although in most cases they are weak, and their strength would be further lessened by the drift; instances are not uncommon of vessels, owing to the existence of an easterly current being assumed, being kept too much to the westward and grounded in thick weather; this, however, might have been avoided by a constant use of the lead.

Kummel Bank, about 3½ miles in length, in a northwest and opposite direction, with depths of from 12 to 20 fathoms over it, lies about 1 mile eastward of Tönneberg Bank, with from 22 to 26 fathoms water between, and deeper water between the southern parts of the banks. Except in the shoaler parts, where the bottom is rocky, it generally consists of sand and gravel, interspersed in places with pebbles.

Böcher Bank, about the same in length and direction as Kummel Bank, has depths of from 11 to 19 fathoms, and lies about 2 miles southeastward of Læso Trindel. The bottom is fine sand on the north and brownish sand, with gravel, on the east side, while the shoalest pare is gravel and rock; it is surrounded by depths of from 21 to 40 fathoms.

Southeast coast.—From Syr Point the coast trends southwest for 1½ miles, with the beacon on it, already mentioned, and then forms a shallow bay about 4 miles wide, from the west side of which it has a southwest direction for about 5 miles to the south point of the island. The coast is low, and 2 miles inland from the latter part is Byrum Church, amongst trees and not easily distinguished from this side of the island.

Bank.—The shoal water, with depths under 3 fathoms, which is nearly 1 mile eastward of Syr Point, from that extends for a distance of 11 miles in a southerly direction, and for the first 5 miles is a part of the shore bank, but for the remainder is a narrow ridge; the

general depths are from 1¼ to 1¾ fathoms, and the bottoms generally fine sand, covered in places with weed and some stones; the east side is fairly steep-to.

Knallen, with a depth of 1¾ fathoms on it, lies at the north end of this bank and about 1 mile southeast of Syr Point. Mellem Ground, with 1½ fathoms water, is about 2 miles southeast by south of Syr Point, and Flynder Ground, 5 miles farther south, has a depth of 2½ fathoms, the deepest water on the ridge, where there is a channel ⅓ mile in width with a depth of 13 feet.

Buoys.—Knallen is marked on its east side by a conical red buoy, surmounted by an upturned broom, in a depth of 4 fathoms.

A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 6 fathoms eastward of Flynder Ground.

Other shoals on the shore bank are marked; see chart.

Kobber Ground is the narrow ridge of the above shoal, from Flynder Ground, for a distance southward of about 6½ miles; it has depths of from 1¼ to 1¾ fathoms over it.

Light.—Near the southern end of Kobber Ground a red beacon, 45 feet in height, placed in a depth of 16 feet, exhibits, at an elevation of 40 feet above high water, an unwatched flashing white light, visible 12 miles.

Whistlebuoy.—A red buoy, with "Kobbergrund Ø" in white letters on it, and having a whistle, is moored in a depth of 11 fathoms, 2 miles east by south of the light beacon.

Buoys.—Kobber Ground is also marked by three buoys, on the north, northeast, and southeast sides.

North buoy, a white can, surmounted by two down-turned brooms, is in a depth of 1¾ fathoms.

Northeast buoy, conical red, and surmounted by two upturned brooms, is in 6 fathoms.

Southeast buoy, conical red, in a depth of 4 fathoms, is surmounted by an upturned broom, and moored 1½ miles southeast of the light beacon.

The channel into the bay before mentioned, on this side of the island, is buoyed.

Bank.—From the southeast extreme of Kobber Ground to a position about 10 miles southward of the south point of Læsö, is a shallow area about 10 miles square, and outside its southeast edge are numerous shoal patches, the positions of which can be only understood by reference to the chart.

The 5-fathom contour line, which is nearly 12 miles southward of Kobber Ground beacon, with numerous shoal heads of from 3 to 3¾ fathoms inside it, may be roughly described as being generally 18 miles southeastward of the southeast coast of Læsö.

Mellem Flat is a shoal bank, with a depth of ¾ fathom, situated on the bank above mentioned, and westward of Kobber Ground; it is separated from Sjollen, part of the shore bank extending from Læsö by Laaen, a channel, in which there is a depth of about 2 fathoms. Aalebjerg Deep lies to the northward of this.

Buoys.—Mellem Flat, Sjollen, and Aalebjerg Deep are all marked by buoys, for which see the chart.

Silderön, which is a dangerous shoal for small vessels, is composed of heaps of stones, with a least depth of 2 feet over them; it lies nearly 6¼ miles southward of the south point of Læsö.

Lightbuoy.—A white buoy, exhibiting a white flashing light every 3 seconds, is moored in 3¾ fathoms water, 870 yards southeastward of the 2-foot depth on Silderön. The buoy is withdrawn annually from the 20th of May to the 20th of July.

Buoys.—A white spar buoy, surmounted by two down-turned brooms, is moored in a depth of 3½ fathoms on the west side of Silderön.

A white spar buoy, surmounted by a straw wisp, marks the southeast side of a 4-foot shoal, 1 mile northwest of Silderön.

Bank.—From Silderön the edge of the bank, 6 miles southward of Læsö, trends westward, and then has a north-northwest direction for 6½ miles, inclosing Brændevin Spit and South Rönner. The bank dries for about 2 miles southward of the island, and on it is Hornfish, a small island. Southward of Silderön, for a distance of fully 9 miles, are several patches of from 2¾ to 3 fathoms, the positions of which will be seen on the chart.

Brændevin Spit extends 4¾ miles in a south by west direction from the south point of Læsö; it has a depth of 1 fathom, and Knæet, 2½ miles eastward of it, has 2 feet water over it.

South Rönner.—The sand bank on which South Rönner stands is from 1 mile to 2 miles in breadth, with depths of from about 1 fathom, and extends 5 miles southward of the west point of Læsö. South Rönner consists of three rocks, one of which is always above water; they lie 5 miles southward of the west point of Læsö.

Beacon.—A beacon, consisting of an iron post, 26 feet in height, surmounted by a red ball, marks the northernmost of the three South Rönner rocks.

South Rönner Flat is about 2 miles in length, in a north-by-east and opposite direction, and has depths of from 2 to 2½ fathoms over it; the 5-fathoms contour line is within 400 yards of its western side. Its southern extreme is about 4½ miles southwest of the west point of Læsö.

Buoy.—A white can buoy, surmounted by one down-turned broom, is moored in a depth of 4 fathoms ⅝ mile southward of South Rönner Flat.

Northwest Reef extends in a west-northwest direction for a distance of 4 miles from the west point of Læsö, and has depth of under ½ fathom for the first half of the distance; the remainder of the reef has from 1 fathom to 2 fathoms over it.

The space between Northwest Reef and Borfeld is shoal, the 3-fathoms contour line being 2 miles off-shore, and that of 5 fathoms, extending fully 1 mile beyond a line joining the extremes of the two shoals.

Light.—The red-light beacon, situated 400 yards within the outer end of Northwest Reef is 47 feet in height, with a white reservoir for gas; it exhibits, at an elevation of 41 feet above high water, an unwatched fixed red light, which should be visible, in clear weather, from a distance of 8 miles.

Submarine telegraph cable.—A cable crosses Læsö Channel to near Solsbæk, and the shore end on the island is marked by two telegraph beacons. See Chapter I.

Anchorages.—There are anchorages for small vessels on the south coast in Aalebjerg Deep, approaching between Mellem Flat and Sjollen, also between Knæet and Brændevin Spit, and on the west coast southward of Northwest Reef.

Læsö Channel, entered from the northward between the north extreme of Dvale Ground and the northwest end of Northwest Reef, a width of 4 miles, and reduced in breadth to 3 miles between the lightvessel marking the southeast side of Dvale Ground and the southwest end of South Rönner, is clear of dangers. Buoys have been described in preceding chapter.

Approaching it from the southward Svitringen, Lange Ledge, West Knoll, East Knoll, and East Flat, with the numerous outlying shoals southeastward of Læsö, which stretch across the entrance from that direction, render it somewhat dangerous, although if the lightvessel marking East Flat is at its station and sighted, the channel westward of and between it and East Knoll is not less than 2½ miles wide, but northward of that a patch 3 miles in length, with a least depth of 4 fathoms, divides the channel; the southwest end of South Rönner is clear of dangers. It is not recommended that vessels exceeding a draft of 26 feet should use Læsö Channel.

Depths.—The depths in the channel are from 7 to 11 fathoms, the water shoaling somewhat to the southward in the direction of East Flat, and for a distance of about 8 miles north-northwest of that lightvessel are several patches of from 4 to 5 fathoms, on the west side of the fairway. The channel westward of East Flat, about 1 mile in width, has depths of from 5½ to 7 fathoms.

The shoaler part of the channel, where depths of from 8 to 9 fathoms lie between lanes of deeper water on either side, is sometimes known as the Ryggen.

Southern approach—Dangers—Lange Ledge, lying about 1 mile within the 5-fathom contour line, which here is 11 miles from the coast of Jutland, consists of a series of shoals about 1½ miles in length in a north and south direction, with depths of from 3¾ to 4 fathoms; it is about 11 miles eastward of the north side of the entrance to Lim Fiord.

West Knoll, 3½ miles southward of Lange Ledge, is about 2 miles in length in a similar direction, and has depths of from 3¼ to 4 fathoms.

East Knoll, with a least depth of 3½ fathoms, is situated nearly 3 miles eastward of West Knoll.

Buoys.—A red spar buoy is moored in a depth of 3¾ fathoms 70 yards southeast by south from East Knoll.

A conical red buoy with one upturned broom as topmark is moored in a depth of 5½ fathoms eastward of Ostlige Knold.

East Flat is nearly 4 miles in length in a north and south direction, and about 3 miles in width within the 5-fathom contour line; it has from 3¼ to 4¾ fathoms water over it, with some deeper spots, and its western side is 2½ miles eastward of East Knoll.

Between the bearings of south and south by east from East Flat Lightvessel are patches of 4½ and 5 fathoms; the southern, with the latter depth, being distant from it about 6 miles.

Lightvessel.—East Flat Lightvessel, masted and painted according to the Danish system (see Chapter I), is moored in about 5 fathoms water, westward of the flat, and exhibits, at an elevation of 33 feet above sea level, a group flashing white light, visible 11 miles.

Fogsignal.—During thick or foggy weather a siren gives three blasts, each of two seconds' duration, every minute.

Buoy.—A white spar buoy is moored in a depth of 3½ fathoms on the middle of the flat.

Directions.—From 1 mile eastward of the Skaw Lightvessel a 181° course should lead to a similar distance westward of Northwest Reef, and when abreast the end Byrum and Vesterö churches should be in line bearing 102°, or Karup and Sæby churches, 298°.

Continuing the same course for a farther distance of 14.5 miles Dvale Ground Lightvessel will be abeam, and a 162° course for 15 miles should lead in the deepest water, and not less than 5½ fathoms, to East Flat Lightvessel, leaving the 51-fathom contour line, surrounding the shoals southwest of Læsö, and that on the east side of East Knoll about ¾ mile on either hand.

In thick or foggy weather Hirsholm should not be approached under a depth of 11 fathoms, and in entering Læsö Channel the western side should be kept to avoid Northwest Reef, but Dvale Ground should not be neared to a less depth than 7 or 8 fathoms;

the deeper water on either side of the Ryggen, already mentioned, and the fogsignal of Dvale Ground Lightvessel may be guides.

If intending to pass through the sound, the course from East Flat Lightvessel to Lyse Ground Light beacon is 143° for about 50 miles, passing about 1½ miles westward of the 5-fathom contour line of the shoals extending in the direction from Anholt, and being southward of them, a direct course may be shaped for the entrance to the sound northeast of Lyse Ground. (Directions for the sound see Chapter V.)

Bound through the Belts from East Flat Lightvessel steer 169° for about 19 miles, or to 1 mile eastward of the buoy marking the northeast extreme of Tangen, and alter course to 174° for 13 miles, to pass 3 miles eastward of Fornæs Lighthouse, from which a 183° course will lead to a position 3 miles northwest of Sejrö Lighthouse and to the fairway track; this course, however, passes over Yder Flat, with a depth of 3¾ fathoms, but by day the buoy should be seen, and by night Schultzs Ground, Hjelm, and Sejrö lights will be a guide in passing it. (Directions for the Great Belt are given in Chapter VII.)

Tides.—It is high water, full and change, in Læsö Channel at about 5h. 25m.

Currents.—It has been already mentioned (see Chapter I) that the current observations have been made with strong winds blowing at the Skaw, and it is further stated that it may be assumed in a vessel coming from the North Sea that if a strong southwest wind, blowing at the Skaw, be well to the southward, and if the wind is also southwest in Læsö Channel, the current will be found setting to the north by east in that channel.

On the other hand, should a strong wind blowing at the Skaw be west-southwest, and veer to the westward when approaching Læsö Channel, a current setting south-southwest will be probably experienced.

With southeast winds in Læsö Channel the current has been found to set almost entirely north-northeast.

With northeast winds in Læsö Channel the current may be expected to set against the wind, caused probably by that wind keeping back the water in the southwest parts of the Kattegat, and the effort to return to the equilibrium level, causing this direction, especially in narrow channels.

With northwest winds the current may be expected to set in nearly all cases to the south-southwest.

As in some cases, the amount of water traveling north from the Belts might not be able to find an outlet through the somewhat nar-

row Læsö Channel, so that a portion would be deflected to the eastward, southward of Læsö, it may be possible that an oblique current may be caused at the southern entrance to Læsö Channel.

Ice.—During severe winters ice forms on the banks of Læsö, especially those off its southwest, south, and southeast sides; but to the north, and especially in the direction of Læsö Trindel, open water is generally to be seen in places, and it is said that ice in any great quantity seldom remains long on the northern shore of the island. On Kobber Ground it remains longest, but even here its stay has never been known to exceed seven weeks.

Læsö Channel is sometimes blocked by an impenetrable barrier of ice, extending from South Rönner to the coast of Jutland.

The ice forms quickest with northeasterly and easterly winds, but Læsö Channel may be cleared at any time by the setting in of westerly winds; these winds also drift the ice to the coast of Sweden, and so clear the western side of the Kattegat, but there are instances of strong breezes from west and southwest blowing for a period of two days without clearing the channel.

In Læsö Channel the ice is never known to be fixed from shore to shore, the current generally keeping open water in mid-channel. In quiet settled weather, however, with a northerly current, the channel in the narrows may become choked by drift ice from the southward, and may so remain for some time. On some of the shoals, as Kobber Ground, Silder Rön, South Rönner, Northwest Reef, and Borfeld, the ice is sometimes piled up to a considerable height; but this never takes place on Læsö Trindel. (See Chapter I.)

Bank.—Læsö and Anholt lie at the extremes of a large bank, having from 4 to 9 fathoms water, and extending from the coast of Jutland eastward to the deep East Channel of the Kattegat. Owing to the shallowness of the water, the sea is never very high on this bank, which not only gives smooth water to the different anchorages along the Jutland coast, but also forms one great anchoring ground adapted for any vessel in moderate weather, and for large vessels under all circumstances.

The eastern portion of this flat, sometimes known as Sanden (the Sand), is chiefly composed of light sand, partially overlaid with seaweed, especially the southern part in the vicinity of Anholt; along its eastern edge the soundings increase suddenly, in some parts to 40 and 50 fathoms.

Westward of the 10-fathoms contour line between the southern extreme of Kobber Ground and the reefs of Anholt and on the detached patches southward of the former the bottom consists generally of fine sand with black specks, but outside that depth the sand is dark and reddish, and mixed in some parts with pebbles.

The outer edge of Sanden not only differs from the deep channel to the eastward by its shoal water, but also by the nature of the bottom, which in the latter is either soft or firm mud. These sudden changes, from deep to comparatively shallow water, and from mud to sand, are of great use to the navigator.

As long as Anholt Lighthouse is in sight from the deck, or while within a 16-mile radius northward of it, a vessel will be southward of the 5-fathoms contour line, southward of Kobber Ground, and in this large open space may traverse the flat in every direction without the least obstruction.

Öster Renden.—In the eastern and deep portion of the Kattegat, between the parallels of Læsö and Anholt, are four distinct banks named Groves Flat, Middel Flat, Fladen and Lilla Middel Ground.

The two first serve as warnings of approach to the bank connecting Læsö and Anholt, but having plenty of water over them are not dangerous; but the two last have shallow patches extremely dangerous to ships of deep draft, although these banks also, being extensive, if carefully approached by the lead, are very useful in marking a ship's position.

Groves Flat, in the fairway of East Channel, its center being 8 miles east by south of the southern end of Kobberg Ground, extends about 9 miles in a northwest by west and opposite direction, with a greatest width of 5½ miles, and has a least depth of 9 fathoms, the bottom on the north end being fine sand and coral, and on the middle and southern part sand and red pebbles, or shells and sand with red specks.

The bank is surrounded by deep water, and commonly soft bottom, except at its southern extreme, where the bottom consists of stones and rock, and is separated from Sanden by a vein of deep water, scarcely 2 miles wide, which, by a careful attention to the lead, may give warning of an approach to Kobber Ground or its adjacent shoals.

A good mark for the southeast edge of this bank is Träslöf Church, high and conspicuous, midway between Varberg church and mill, bearing about 84°.

Middel Flat, southward of Grove Flat, and separated from Sanden by a narrow, crooked vein of deep water, with from 21 to 35 fathoms, is about 5½ miles in length in a north-northwest and opposite direction, with depths varying from 7 to 19 fathoms, over gravel and red sand mixed with pebbles, particularly on the eastern side, where the depth increases very suddenly to over 40 fathoms, with soft mud, which bottom continues, but with a decreasing depth of water, to the eastward.

Fladen, a bank composed of sand, coral, shells, and small red stones, is about 21 miles southeastward of Syr Point and nearly in

the middle of East Channel; it is about 5½ miles in length in a north-northwest and opposite direction, within the 10-fathom contour line, and 3½ miles greatest width, the depths being from 3½ to 9 fathoms.

The shoalest part, about 1½ miles within the northwest end, is a patch of 3½ fathoms, which is 9 miles southwestward of Nidingen; two patches of 4¼ fathoms are near the east side; northwest of the northern is a spot with a depth of 3¾ fathoms, and a depth of 4½ fathoms is northwestward of the southern 4¼-fathom patch.

A bank about 2¾ miles in length in an east and west direction, and with depths of from 6 to 9 fathoms, is separated from the northeast end of Fladen by a channel about ½ mile in width, with a depth of 12 fathoms; and 1⅞ miles northeast of this bank is another with patches of 9 fathoms.

Lightvessel.—A Swedish Lightvessel, moored near the east side of Fladen, has the hull painted red, one mast surmounted by a ball, a tower, and "Fladen" painted on the sides.

It exhibits, at an elevation of 33 feet above sea level, a group flashing red light, visible 11 miles.

Fog signal.—A steam siren gives four blasts, each of four seconds duration at intervals of four seconds every minute. Should the siren be disabled, a bell is sounded four times in succession every minute (approximately).

Buoys.—A red spar buoy, surmounted by a ball under a down-turned broom, marks the western side of the 3½-fathom patch.

A black and white spar buoy, surmounted by a black ball, is moored on the northeast side of the 4-fathom depth on the east side of Fladen.

Lilla Middel Ground, 5⅓ miles in length in a northeast and southwest direction, and 3⅛ miles in greatest width, is a bank lying 9¼ miles south-southeast of Fladen. The bottom is sand, gravel, stones, and coral, shoaling gradually from the northwest side to a line of shoals in a northeast and southwest direction on the southeast side of the bank; the depths on these shoals are from 3 to 4 fathoms.

Several small banks, with from 8 to 10 fathoms water over them, lie eastward of Lilla Middel Ground in the direction of Morups Tånge.

Lightbuoy.[1]—A conical black buoy, with a white band, and exhibiting a flashing white light every three seconds, is moored northeastward of Little Middle Ground.

Buoys.—A black spar buoy, with a white band, and surmounted by two balls, is moored between the lightbuoy and the northeast end of a 4-fathom shoal.

[1] To be replaced by a light and whistle buoy painted black with a white band, exhibiting a flashing white light every 3 seconds.

A large red spar buoy, surmounted by a down-turned broom, is moored at the southwest end of the 3¼-fathoms patch of the shoal.

Anholt, which lies 35 miles southeastward of Læsö, and 25 miles northeast of Fornæs, is about 6 miles in length, in an east-and-west direction, and about 3 miles in greatest width, at its western, and tapering to a point in a sandy spit at its eastern end; there are no trees on the island. The population of the island was 342 in 1906.

Nordbjerg, 128 feet, at the northwest, and Sönderbjerg, 154 feet, at the southwest side, the two highest points, with wooden beacons on them; Anholt Church, painted white and with a spire, and the light tower are all conspicuous marks. Anholt town, near the church, and eastward of the highest land, is not visible from seaward.

Light.—About 1,700 yards from the east point of the island a circular white tower, 138 feet in height, with a red band, exhibits, at an elevation of 131 feet above high water, a flashing white light visible 17 miles.

A fixed white light shown below the above is a signal regarding Anholt Knob Lightvessel. (See Chapter I.)

Signal station.—Vessels can communicate by the International Code with the lighthouse, which is in telephonic communication with the telegraph office in the town.

Lifeboat.—A lifeboat is stationed at the lighthouse.

Submarine telegraph cable.—A cable from the coast to the southward of the lighthouse connects with Hesselö; its shore end is marked by a white telegraph pole surmounted by a triangle.

Dangers.—The west coast of Anholt has a north-northwest direction for about 3 miles, and from it a bank, with depths of and under 3 fathoms, extends forming two points of shoal water, the southern extending 4 miles and the northern 3¼ miles; the 5-fathom line is fully 6 miles from this end of the island.

Stensöre, lying on the inner part of this bank, and about ½ mile offshore abreast of Sönderbjerg, has depths under 1 fathom over it, and the inner portion of this bank, fronting the coast, extends for about 1¼ miles, with depths of from 1½ to 2 fathoms.

Buoy.—A white can buoy, surmounted by one down-turned broom, is moored, in a depth of 1¾ fathoms, westward of Stensöre.

Anholt Harbor, immediately southward of the northwest point, is formed by two breakwaters, the northern, about 1,100 feet in length, curving round from southwest to south; the southern, about 1,450 feet in length, extending to the westward, and near its head, curving west-northwest toward the north breakwater head, the entrance between them facing southwest being 160 feet in width.

Inside the south breakwater an arm, about 720 feet in length, extends to the northwest, dividing the harbor into two parts, and a

short pier extends from the shore to the head of this arm, with an entrance into the inner harbor between them 150 feet in width; the area of the outer harbor is about 11½ and of the inner 8½ acres. The harbor-master's house, with a flagstaff, stands about 200 yards eastward of the inner harbor.

The depths in the entrance are nearly 2¼ fathoms, and about 2 fathoms over a part of the outer harbor, but only 1½ fathoms alongside the outer part of the south arm; inside it and over the inner harbor there are about 2 fathoms.

There is a difference of less than 1 foot between high and low water, and westerly gales raise the water about 3 feet, or even 5 feet in the entrance, easterly gales lowering it about the same.

Lights—North breakwater.—On the north breakwater head, a cylindrical iron tower painted red and white, in bands, exhibits, at an elevation of 26 feet above high water, a fixed and group flashing light, with white, red, and green sectors, showing white, red, and green fixed and a white and a red double flash; for the bearings of the several sectors, see the Light List.

The white light is visible 10 miles. the red light 8 miles, and the green light 7 miles.

Fog signal.—During thick or foggy weather a bell will be rung from 10 to 15 seconds every minute.

South breakwater.—On the south breakwater head a fixed light, with red and green sectors, is exhibited at an elevation of 26 feet above high water from a white post.

Inner harbor.—A fixed green light is exhibited, at an elevation of 20 feet above high water, from a white post on the south arm head at the entrance to the inner harbor.

A fixed white light is similarly exhibited at the head of the north pier, and on that side of the entrance to the inner harbor.

Entrance signals.—When vessels can not enter one black ball is hoisted and when they can not leave .two black balls are shown. By night fixed green lights are shown at the side of and a little above the fixed white light.

Beacons.—Three dark-colored beacons stand eastward of the harbor. The southern, on Dræthöj sand hill, is surmounted by a square; the middle beacon, on the southern sand hill of Nordbjerg, has a diamond, and the northern beacon, on sand hills north of the harbor, has a triangle, apex downward, as top marks.

Directions.—The southern beacon, in line with the north mole breakwater lighthouse, marks the north limit of a depth of 14 feet in the channel, and the middle beacon in line with the same, gives the southern limit of that depth. The north beacon in line with that lighthouse gives the southern limit of the depth of 11 feet.

Current.—The current nearly always sets to the northward across

the entrance, but with gales from the north or northwest it may set to the southward.

Communication.—The post and telegraph are at the village, but letters can be posted near the harbor; the telephone is at the custom-house.

Water may be obtained from a well near the harbor.

Repairs.—A crane will lift 2 tons.

Life-saving station.—A lifeboat and a rocket apparatus are maintained at Anholt Harbor.

Dangers.—Northwest Reef stretches for a distance of 5½ miles in a northwest direction, from the land immediately northward of the northwest point, and about ½ mile from its commencement is a very narrow channel through it named Rönne Channel in which the depth is 1 fathom.

Slusen is another channel over the reef with a depth of 1½ fathoms, fully 1 mile farther north, and from it the reef extends for 4 miles in a very narrow ridge of rock, on which the depths are from 1 fathom to 1¼ fathoms.

The reef is surrounded by shoal water with depths under 3 fathoms, which at northwest point is 3½ miles in width, gradually tapering to the end of Northwest Reef and the 5-fathom contour line is 3 miles northwest of the same end.

Buoys.—A white can buoy, surmounted by three down-turned brooms, is moored in a depth of 5 fathoms at the extremity of Northwest Reef.

A conical red buoy, surmounted by two upturned brooms, is moored on the west side of Slusen.

A white can buoy, surmounted by one down-turned broom, is moored on the east side of Slusen.

A white spar buoy, surmounted by two wisps of straw, is moored on the northeast end of the inner part of Northwest Reef, and on the south side of Rönne Channel.

North coast—Dangers.—The eastern edge of the shoal that surrounds Northwest Reef from its extreme, has a southeast direction to the north coast of the island, 3 miles eastward of the northwest point. From this a narrow shoal, 3 miles in length, with from 1½ to 2¼ fathoms over it, lies parallel to the coast, and about 1 mile off it, the 5-fathom contour line being nearly 1½ miles off-shore.

East Reef, a dangerous reef, fairly steep-to on both sides, and consisting of sand and some stones, extends for nearly 4½ miles from the east point of the island, with a breadth of about ½ mile.

On the reef, about 1¼ miles from the point, is Kobber Spit, on which the depth is 4 feet, and beyond that to the end the depths on the reef are from ¾ fathom to 2 fathoms; the Knob at the extremity is so named on account of an islet once existing in that position.

Lightvessel.—Anholt Knob Lightvessel, masted and painted according to the Danish system (see Chapter I), is moored in a depth of 16 fathoms, about 1½ miles eastward of the Knob; it exhibits, at an elevation of 33 feet above sea level, a group flashing white light visible 11 miles.

Fogsignal.—During thick or foggy weather a siren gives two blasts, each of three seconds duration, in quick succession every minute.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 4 fathoms at the extreme of East Reef.

Current.—When in the vicinity of this lightvessel the possibilities of a current which may be setting directly against, or obliquely toward, the wind, which has been mentioned, must not be overlooked, as its direction may be toward the reef, and its velocity may attain 1¼ knots.

Southeast coast.—The southeast coast is free from outlying dangers, the 10-fathom contour line being less than ½ mile offshore. The slight bight formed by the southeast coast is named Pakhus Bay.

Anchorages.—Vessels can anchor on the north side of the island in depths of from 4½ to 6½ fathoms, or small craft may go in to 2½ fathoms.

In Pakhus Bay anchorage may be obtained in 11 fathoms water, and small vessels may anchor off the west end of the island, but there is no lee for large vessels in westerly winds.

Röde Bank, 15 miles east-southeast of Anholt, is small, and has a least depth of 13 fathoms, over reddish brown and yellow sand, with some coral.

Stora Middel Ground, lying nearly midway between Anholt and Kullen, is about 3½ miles in circumference within the 10-fathom contour line; the least water on it is 3½ fathoms on the west side, and on the east edge there is a patch of 4¾ fathoms, the bottom being generally stones and gravel.

Lightbuoy.—A black buoy, with a white band, and exhibiting a flashing white light every three seconds, is moored northward of the depth of 4¾ fathoms on the east side.

Buoys.—A white can buoy, surmounted by one down-turned broom, is moored in a depth of 9¼ fathoms westward of the 3½-fathom depth.

A black spar buoy is moored in 4 fathoms near the least water.

Wreck.—A sunken wreck lies about 6 miles 62° from the lightbuoy and has 9 fathoms over it. It is near the track of southward-bound vessels.

CHAPTER V.

PART OF THE SOUND, INCLUDING LANDSKRONA, COPENHAGEN, HOLLÆNDER DEEP, AND DROGDEN CHANNEL.

The Sound (Sundet)—General remarks.—The Sound (Ore Sund, of the Swedes) is the strait separating Sjælland, or Zealand, from Sweden; and from its northern boundary, which is an imaginary line joining the Kullen to Gilbjerg Head, it has first a southeast direction for 13 miles, and then turns to the southward for 43 miles to its southern boundary, which is a line joining Falsterbo Point and Stevns Cliff.

At 13 miles from its northern boundary it narrows to a width of about 2 miles between Helsingör and Helsingborg, but about 7 miles to the southward of this it expands to about 8 miles and is here divided by Hven Island into two channels, the western 4¼ miles and the eastern 2½ miles in width, the navigable portion being considerably less.

Between Copenhagen and Lomma Bay, 12 miles farther south, the width of the sound is 15 miles, but southward of this line it again contracts and is encumbered by numerous shallow flats and banks, on the largest of which is Saltholm, an island dividing it into two channels; Drogden, the western, having a width of about 2½ miles, and Flint Channel, the eastern, about 4 miles; but the navigable parts in both channels are reduced by banks and shoals to about ½ mile and 1 mile, respectively.

Amager, an island situated to the westward of Saltholm, is separated from the east coast of Zealand by Copenhagen Harbor and a very narrow channel, extending to the southward from it, and Copenhagen, on the west, and Landskrona, on the east side, are the only two natural harbors in the sound.

Depths.—The depths in the northern part of the sound are from 12 to 25 fathoms, but southward of Landskrona they decrease, and as far as Saltholm Flat, the bank extending northward of Saltholm, and, on the eastern side to Malmö Road, they are from 6 to 9 fathoms.

Southward of Saltholm the depths are still less, and 3¼ fathoms is charted in mid-channel of Drogden Channel, but there is a depth of about 4 fathoms on the line of the leading marks through Flint Channel, which is available for vessels drawing 23½ feet water, by night as well as by day; southward of Drogden Channel the depths

gradually increase to from 8 to 12 fathoms at the southern boundary of the Sound.

Öretvisten.—About 5 miles northward of Helsingborg, and one-third of the distance from the Swedish to the Danish coast, is the north end of a narrow vein of deeper water than that of the Sound at this part; the vein extends for a distance of about 4 miles, in a southeast direction, and has depths of from 21 to 25 fathoms, the general depths on either side of it being from 14 to 16 fathoms.

The bottom consists of coarse sand, mixed with shells and stones, which is also found between this vein and the Swedish shore, but on its western side it consists of fine sand, with black specks.

The water shoals somewhat suddenly on both sides of Öretvisten, and obtaining soundings in it may assist in verifying a vessel's position in thick weather.

Pilots.—Those unacquainted with the set of the currents in the Sound might obtain some advantage by employing a pilot, especially to reach one of the harbors in it, but the lights and buoyage should be sufficient guides for ordinary navigation.

On the Danish shore, pilots from Helsingör, who will take vessels through the Sound into the Baltic, are generally cruising a short distance northward of Kronborg; pilots belonging to Helsingör are also stationed on board Lappe Ground lightvessel, and will take vessels to all harbors in the Sound, both Danish and Swedish, also into the Baltic by either Flint or Drogden Channels. They board vessels from the southward at Drogden lightvessel, and have the exclusive right of piloting Drogden channel.

On the Swedish coast pilots are to be obtained at Högänäs, Svinbådan lightvessel, and at Helsingborg, and take vessels through Flint Channel; Swedish pilot vessels in the northern part of the Sound cruise between the Kullen and Svinbådan lightvessel, and in the southern part between Falsterboref lightvessel and the southern entrance to Flint Channel. (See also next chapter.)

When pilots are on board Svinbådan lightvessel, the Swedish pilot flag by day, or a white light by night, are hoisted at the after gaff.

Buoyage.—Drogden Channel is buoyed on the Danish system, and Flint Channel on the Swedish system. (See Chapter I.)

Currents.—The general northerly set of the current from the Baltic, and that to the southward from the Kattegat, has been already described in Chapter I, and it is now necessary to deal with the local conditions of these currents in the Sound.

During the whole year the north-going stream will be found generally to be in excess of that to the southward, and the former current is increased in strength by winds from north-northeast through

east to south-southwest, while those from north-northwest through west to south-southwest as a rule cause a southerly current.

A calm, occuring during the time that a northerly current is running, generally causes the water to flow back into the Baltic, first underrunning the northerly current, and afterwards spreading to the surface, and ordinary changes from a north-going to a south-going stream or vice versa, usually commence in a similar manner.

Northerly current.—The water from the Baltic flows into and sweeps round Kjöge Bay toward Aflands Point, the south point of Amager, from which the main stream sets through Drogden and Flint Channels, a branch passing through Sorte Channel and Copenhagen Harbor.

The branch passing through Drogden Channel first sets in a northeast direction toward Saltholm, and then follows the direction of the channel and Konge Deep, dividing to the southward and setting on both sides of Middel Ground.

These two branches again unite close to the southward of Taarbæk Reef and flow toward and along the Danish coast, turning to the eastward when southward of Kronborg Point, and setting over Lappe Ground, attaining considerable velocity at 1 cable northward of Kronborg Point; from Lappe Ground this stream sets toward Ellekilde Point, and close along shore round Vesterlands Ground.

This branch sometimes extends farther offshore, when a counter current is usually formed between, and this may be the commencement of a south-going current, resulting from westerly winds in the North Sea.

The branch passing through Flint Channel follows the Swedish coast as far as Landskrona, throwing off a weak current, which goes to the westward of Hven, but the main portion passes eastward of Hven, and continues up the coast past Helsingborg, and also unites with the branch which has passed through Drogden Channel, southward of Lappe Ground, there attaining great velocity.

Strong eddies are found to the northward of Hven, where the two streams unite.

When the northerly current sets toward Vesterlands Ground, the eastern current boundary, which is always visible close to Hittarps Reef, is westward of Svinbådan and from 1 mile to 2 miles off Kullen.

Southerly current.—The south-going stream from the Kattegat attains considerable velocity between Lappe Ground and Hittarps Reef, the former shoal and the current that runs inside it deflecting it to the eastward; it then passes on both sides of Disken and Hven, the western branch setting in a southwest direction toward Rungsted, on the Danish coast, where it bifurcates, one stream running to the

northward up the coast, over Nivaa Flat, as far as Snekkersten, where it is deflected to the eastward by the land, and again joins the stream running westward of Disken.

The other part of this stream sets to the southward from Rungsted and over the outer edge of Taarbæk Reef.

The portion of the stream which passes eastward of Hven also splits after passing that island, the western branch, from Gråen, sets over toward Taarbæk Reef, where it joins that part of the current that has passed westward of Hven, and together they run toward Middel Ground.

The other branch, having passed Gråen, sets through Flint Channel.

The south-going stream from Taarbæk Reef, just mentioned, divides into three parts, the western of these running through Konge Deep and Copenhagen Harbor and the middle and eastern setting through Hollænder Deep, the latter of these being deflected toward it by the Saltholm Flat; this current through Hollænder Deep is also joined by that which has passed through Konge Deep and is united with the south-going stream from Flint Channel, near Drogden Lightvessel, except a part which has set over South Röse Sandrevet. Drogden lightvessel lies in the Flint Channel current.

These united currents set across Kjöge Bay, impinging on the land in the vicinity of Kjöge Sönakke, and there bifurcating, one branch running up the coast to Kjöge, where, turning to the northeastward, it again meets the currents from Drogden and Flint Channels, to the southward of Amager; the other branch passes Stevns Cliff into the Baltic.

Change in direction.—Changes in the direction of the currents usually take place in the first instance near the bottom, the conditions on the surface being for the time unaltered, but the meeting of the currents coming from opposite directions generally causes a rise in the level of the water, but seldom exceeding from 3 to 3½ feet.

A south-going current, suddenly meeting one setting north, raises the level to the northward of Drogden and Flint Channels, and a north-going stream, meeting one setting to the southward, raises the water near Dragör, while near Taarbæk and farther north it causes a low-water level.

The foregoing remarks on the currents may be subject to considerable alteration, depending on the wind and weather conditions, both of which are liable to make changes, and although a general knowledge of the direction and velocity of the currents may be of assistance in the navigation, there are numerous eddies and counter streams only well known to the pilots, who are able to use them to advantage, especially in piloting a sailing vessel.

In navigating the sound attention should be paid to the direction in which light vessels and others at anchor are turning, as being a guide to the stream running in the locality.

Caution.—It has been reported that heavy gales and severe winters occasionally cause dislodgement of bowlders on the bottom of the sound, between Helsingör and Dragör, and in Flint Channel stones are said to be moved by drift ice.

Note.—In the present chapter both sides of the sound are partly described, first taking the Swedish shore, from the Kullen to and inclusive of Helsingborg; and then the Danish shore, as far as Vedbæk, including Helsingör; the Swedish shore is then given from Helsingborg to and including Landskrona, followed by the Danish shore from Vedbæk to Copenhagen and Drogden Channel.

Chapter VI includes the Swedish shore from Landskrona to Falsterbo Point, with Flint Channel and also the east coast of Zealand as far as Stevns Cliff.

Swedish shore.—The coast of Sweden southward of the Kullen is low and sparsely wooded and continues so for nearly 12 miles, until a little southward of Viken, a fishing village, when it again rises until near Helsingbörg, terminating in an isolated hill, light in color and steep toward the sea.

Landmarks.—Among the most conspicuous objects are Väsby and Viken Church spires, the former about 1½ miles eastward of Höganäs; Kulla Gunnarstorp, an old mansion house with a slender tower, about 2½ miles southeastward of Viken, has moderately high and wooded ground surrounding, and a mill about ⅓ mile southward of it; Sofiero Castle, 1¾ miles southeastward of Kulla Gunnarstorp; two white telegraph beacons, from which lights are exhibited by night, about 1 mile northward of Helsingborg; and the high square Kärnan tower between, but a square, red tower between it and the shore might be mistaken for it.

Mölle, a fishing harbor nearly 2 miles southeastward of Kullen, is formed by a breakwater, 558 feet long, in a north-northwest direction, and further protected by a reef nearly 200 yards from the pier end; there is a depth of 9 feet at low water in the harbor.

Light.—A fixed light, with white and red sectors, is exhibited at an elevation of 15 feet above sea level, from an hexagonal white tower on the pier end.

Buoys.—A red spar buoy, surmounted by a downturned broom, marks the reef off the pierhead, and the entrance is marked by a red and a black barrel buoy, the former with a ball over a down-turned broom and the latter with a ball.

Directions.—When entering the harbor pass to the northward of the spar buoy, and between the barrel buoys and by night keep in the red sector of the breakwater light.

Storm warnings are posted up at Mölle. (See Chapter I.)

Communication.—Daily steamers connect with West Skånes and other ports, but the nearest rail is at Höganäs, about 7 miles distant; there is a post and a telegraph office, and a telephone to the coast-guard station.

Supplies of provisions may be obtained.

Lerhamn, 2 miles south-southeast of Mölle, is a small fishing place formed by a pier 302 feet long; it has a depth of 5¾ feet at low water, and is only suitable for small vessels.

Leading lights.—Two fixed white leading lights, 164 yards apart, are exhibited at elevations of 12 and 15 feet, respectively, above sea level, from posts on the pierhead; they are for the use of fishermen.

Nyhamn, a small harbor about 1 mile farther south, has a pier 279 feet long, and a depth of 5 feet at low water.

Gaddebådabåden, a reef with 3 feet water over it, extends for a distance of 1,400 yards in a westerly direction from the shore at Nyhamn.

Dangers.—The coast to Höganäs, for a distance of 3 miles, is fronted by shoals which extend nearly to the 5-fathoms contour line, which is here about 1 mile off it.

Skärsbåden, a reef with 4 feet water on the shoalest part, and 5 fathoms close-to, extends nearly 1 mile from the shore about 1 mile southward of Nyhamn. The western side of Skärsbåden is marked by a red spar buoy, surmounted by a down-turned brcom.

Nordskärsbåden, nearly 1,400 yards south-southwestward of Skärsbåden, and fully ½ mile from the beach, is a narrow ridge of rock, 600 yards long, in a north and south direction, with 6 feet of water on its shoalest part. Eastward of this reef the depth is 2½ fathoms, and on the west side it increases suddenly to 6 fathoms.

Stenbrottsryggen, a rocky shoal, about ⅔ mile in length, in a northeast and opposite direction, and with 2½ fathoms least water over it, about 1¼ miles southward of Skärsbåden, and nearly 1,800 yards offshore.

Mölle Ground, with a depth of 2½ fathoms on its shoalest part, over large rocks, is 1,800 yards distant from the shore, westward of Höganäs. Between Mölle Ground and Nordskärsbåden are several patches with 2½ fathoms water on them. A red spar buoy, surmounted by a staff and two down-turned brooms, is moored in 5 fathoms water, close to the western extreme of Mölle Ground.

Långörs Reef, with depths under 12 feet, extends ⅔ mile from the point that distance northward of Höganäs pier. Near the western extremity of Längörs Reef is a red spar buoy, surmounted by a ball under a down-turned broom.

Clearing mark.—East Högkullen (616 feet high) in line with the northwest side of Lerhamn village, bearing about 11°, leads west of Mölle Ground and the adjacent shoals.

Höganäs is a port protected by a pier, 1,837 feet long, in a southwest direction, and bending to the southward at its extremity; it has a quay space of 1,296 feet, of which 755 feet have the same depth alongside as in the harbor, while 295 feet have a depth of 13¾ feet, and 246 feet have 8¾ feet alongside.

Light.—From a stone tower, 19 feet in height, on the pierhead, an occulting light with white, red, and green sectors is exhibited, at an elevation of 29 feet above sea level; the white light is visible 6 miles, the red light 4 miles, and the green light 3 miles. (For bearings of sectors, see Light List.)

Beacon.—A beacon, consisting of a red pole 55 feet high, with many supports, surmounted by a barrel, with a square black board below it, stands a little back from the southern part of the town of Höganäs.

Dangers.—In addition to Mölle Ground, already mentioned, the harbor is fronted by two shoals and entered between them.

Aske Ground, the northern, with a depth of less than 1 fathom over it, lies nearly 1,400 yards westward of the pierhead.

Hamnbåden, the extreme of which is about ½ mile southward of Aske Ground and the same distance west-southwest of the pierhead, has a least depth of 7 feet.

Hebe Ground is a rock lying 600 yards northwestward of the pierhead.

Buoys.—The northern side of Hamnbåden is marked by two black spar buoys, the western surmounted by two balls and the eastern by one ball.

Hebe Ground is marked by a small red and black spar buoy, surmounted by a cross, and other dangers are marked, for which see the chart.

Depths.—There is a depth of 5 fathoms in the approach, between the shoals, and 12¾ feet in the harbor.

Wreck.—A wreck with 1.6 feet of water over it lies sunk southwestward of Höganäs. A green buoy with 2 green flags is moored north-northeastward of the wreck and a green buoy with green flag south-southwestward of the wreck.

Pilots may be obtained, and one should be employed for entering.

Directions.—When about 2 miles off the harbor bring Vasby church in line with the beacon, bearing 74°, and steer for it, which will lead northward of the buoys marking Hamnbåden, and when East Högkullen is in line with the first point northward of Höganäs, 356°, keep somewhat to the southward for the anchorage.

By night.—Steer for the sector of white light bearing about 168°.

Anchorage.—The outer anchorage, in depths of from 2½ to 3 fathoms, is about 200 yards southward of the pierhead over a bottom of sand and clay; west and northwest winds send in some sea.

Town.—Höganäs is an industrial town of about 5,200 inhabitants, with old coal mines and large factories of fireproof bricks and glazed tubes, etc.

Buoys.—The dredged channel leading to a new wharf at Höganäs is marked on the northern side by red buoys, each with an upturned broom as topmark, and on the southern side by black buoys.

Communication.—There is a railway to Helsingborg, via Kattarp, also post and telegraph and a telephone to the coast guard station.

Supplies of provisions may be obtained, and water in small quantities.

Life-saving station.—A lifeboat is stationed at Höganäs.

Coast—Dangers.—From Höganäs the coast trends to the southward for about 3½ miles and is fronted by dangers, extending from ⅛ to ⅜ of a mile.

Jungnäsbåden, consisting of two patches, with a depth of 1¼ fathoms over its southeast end, is about 1,400 yards in length in a north-northwest and opposite direction, and its outer edge is fully a mile offshore.

Jungnäsbåden is marked on its western side by a red spar buoy, surmounted by a ball over a down-turned broom.

Lightvessel.—Svinbådan Lightvessel, moored 1¼ miles off this coast, and about ½ mile southwest of Jungnäsbåden Buoy, has a red hull, with "Svinbådan" on the sides, and a tower mast, from which is exhibited, at an elevation of 33 feet above sea level, a flashing red light, visible 11 miles.

Fog signal.—A steam siren gives three blasts of three seconds each at intervals of two seconds every minute.

Should the siren be out of order a bell will be sounded.

Pilots.—The lightvessel is a pilot station for the northern part of the sound, and when pilots are on board a blue and white flag by day and a white light by night is shown at the after peak of the vessel. There is also a steam pilot vessel stationed between Kullen and Viken.

Lerberget, a fishing village and small harbor, is formed by two piers, situated abreast of Svinbådan lightvessel; there is a depth of about 5 feet in the harbor.

Light.—From an iron post on the north pierhead a fixed green light is exhibited, at an elevation of 11 feet above sea level, visible 2 miles, but it is only shown when required.

Storm warnings are posted up at Lerberget. (See Chapter I.)

Dangers.—Sillören, a shoal with a depth of about 4 feet over it, lies about 1,400 yards westward of Lerberget, and a patch of 2 fathoms is between it and the south side of Jungnäsbåden. The east side of Sillören is marked by a black spar buoy, surmounted by a ball.

A shoal, with less than 6 feet over it, situated between Sillören and Lerberget, is marked on the northern side by a red conical buoy.

Svinbådan, a shoal with a depth of ¼ fathom over it, lies ½ mile offshore at nearly 1 mile northwest of Viken. The western side of Svinbådan is marked by a large red spar buoy, surmounted by three down-turned brooms.

Stenskärsbåden, with ½ fathom water over it, is 400 yards southward of Svinbådan.

Clearing marks.—Viken Mill, open southward of Viken Church, bearing about 91°, leads southward, and Kulla Gunnarstorp in line with Gnetaröd House, 131°, leads southwestward of the above shoals.

Viken, a large fishing village, has a good harbor formed by two piers extending in a southerly direction, the western 672 feet in length; there is about 2,000 feet of quay, with a depth of 8 feet alongside at low water, and vessels of that draft can enter the harbor at low water.

Light.—A hexagonal-shaped white tower, 13 feet in height, and situated on the west pierhead, exhibits, at an elevation of 23 feet above sea level, a fixed light with white, red, and green sectors; the white light is visible 5 miles, and the red and green lights 3 miles. (For bearings of sectors, see Light List.)

Anchorage may be obtained outside the harbor in depths of from 2¾ to 6½ fathoms, over clay and stones, but it is exposed to winds from northwest through west to south.

Communication.—There is a post and telegraph office, and a telephone to the coast guard; the nearest railway station is at Höganäs.

Supplies of fresh provisions may be procured, and water is plentiful.

Coast.—From Viken the coast trends in a south-southeast direction, for 6½ miles, to Helsingborg, the land being higher than that preceding it.

Depths offshore.—Kulla Gunnarstorp Mansion House, with its tower, situated nearly 3 miles south-southeastward of Viken, is a conspicuous object on this coast. The 5-fathom contour line, which is about 600 yards off Viken, at a mile southward of that place, commences to draw off the land, and for about 2 miles it is distant nearly

¾ mile from it, then approaching the land and maintaining distances of from 600 to 1,000 yards to Helsingborg.

Dangers.—The following shoals lie off this coast, as far south as Hittarp, after which there are no outlying dangers to Helsingborg.

Trinne Ground, a rocky shoal, on which the depth is ½ fathom, lies 800 yards from the beach at about 1,200 yards southward of Viken Piers. The northwest extremity of Trinne Ground is marked by a large red spar buoy, surmounted by one down-turned broom.

Domstens Reef, which breaks, extends for nearly 800 yards almost parallel to the shore at about ¼ mile off it, and small craft find anchorage between; its northern end is about 200 yards southward of Trinne Ground.

Grolle Ground, lying near the 10-fathoms contour line, which is here close to the 5-fathom contour, has 2½ fathoms water over it, and is 1,200 yards from the shore westward of Gnetaröd house; another shoal, with the same depth, lies nearly midway between it and the coast, and a shoal with less than 1 fathom over it, is about 600 yards southeast of Grolle Ground. The west side of Grolle Ground is marked by a red spar buoy, surmounted by a down-turned broom over a ball.

Clearing mark.—East Högkullen open westward of Viken Church, bearing about north by day, or the fixed green sector of Viken Light by night leads westward of Grolle Ground.

Kulla Gunnarstorps Ground is the shoalest part of a prong of shoal water extending in a northwest direction for nearly 1½ miles from the Shore at Hittarp; it has a depth of ½ fathom over it, and the western edge of the prong is close to the 5-fathom contour line.

Bellbuoy.—A red bellbuoy, surmounted by a staff and down-turned broom, is moored westward of the end of the prong of shoal water, and about 1,200 yards west-northwest of Kulla Gunnarstorps Ground.

Current.—The north-going current sets strongly over the shoal.

Hittarps Reef, shoal, rocky ground, extends for ½ mile in a northwest direction from Hittarp and inside Kulla Gunnarstorps Ground.

Clearing mark.—Haken, the east extreme of Hven, just open of Kronborg Point, bearing 157°, leads westward of Kulla Gunnarstorps Ground.

Telephone beacons—Lights.—Two triangular-shaped telephone beacons, surmounted by a round top mark and situated ½ mile northward of Helsingborg, are in line bearing 61°, which is the direction of a telephone cable. By night fixed red lights are shown from them at 100 and 115 feet, respectively.

Submarine cables.—Two submarine cables have been laid from a point about 1½ miles northward from Helsingborg Harbor, in a 242°

direction to the coast of Zealand northward of Helsingör. The northern cable is marked on each coast by two white beacons, each with a white diamond-shaped topmark, which in line point out the direction of the cable. An occulting green light is shown from each beacon.

Mariners are warned against anchoring on the routes of these cables.

Helsingborg.—The harbor of Helsingborg is formed by two breakwaters, the norther, 2,790 feet long, in a south by east direction, and the southern, which extends to the north-northwest, 1,476 feet; the northern breakwater overlaps the southern 230 feet, and the entrance between the heads, open to the southward, is 154 feet wide. The space inclosed by the north pier is 700 feet long and 170 yards wide, and by the south pier, 460 yards long and about the same width; there is also a small eastern harbor.

In the north harbor the length of quayage is 4,494 feet, in the south harbor 3,018 feet, and in the east harbor 1,673 feet. See plan of harbor on H. O. Chart 4868.

Lights.—On the north pier arm, 110 yards from the pierhead, a red brick building, 61 feet in height, exhibits, at an elevation of 56 feet above sea level, a white fixed light with an occulting sector, which should be visible in clear weather from a distance of 13 miles.

On the north pierhead a white iron tower, 23 feet in height, exhibits, at an elevation of 30 feet above sea level, a fixed red light.

Two fixed green leading lights with fixed white sectors are shown from the harbor and are in line bearing 10°, and in clear weather should be seen from a distance of 5 miles.

Fog signal.—During thick or foggy weather a hand foghorn on the pierhead gives four blasts in quick succession every minute.

Lloyd's signal station.—Vessels can communicate by the International Code with a Lloyd's signal station. (See Chapter I.)

Ice and storm signals are shown, and wind signals are made from a pilot's house by means of the large hand, similar to that of a clock. (See Chapter I.)

Life-saving station.—A lifeboat and a rocket apparatus is maintained at Helsingborg.

Depths.—The depth in the north harbor is 3¾ fathoms, in the south harbor 3 fathoms, and in the east harbor about 2¼ fathoms.

Anchorage.—Helsingborg Roadstead affords anchorage in a depth of 11 fathoms over clay with good holding ground, about ½ mile southward of the entrance to the harbor, the best berth being with Kärnan tower in line with the lighthouse on the pierhead, bearing 50°, and Glumslof Church in line with the eastern chimney of the copper works, which has a white band, 142°.

Pilots can be obtained, the pilot house being on the north pier.

Directions.—Kärnan Tower, high and square, with another square tower painted red between it and the shore, also the two white telegraph beacons mentioned above, should all assist in pointing out the locality, and having brought the entrance to bear 5°, when about 600 yards distant from it steer for it and between the pierheads. Care is necessary when entering, as the current sets strongly.

By night.—The fixed green lantern lights in line, bearing 10°, lead between the pierheads.

Town.—Helsingborg, a rapidly thriving commercial town, and a chief center of export of dairy produce, stretches along the shore of the entrance to the Sound, and on the slope of a small range of hills; the center is the oldest part of the town, and here is the market place, from which a broad flight of steps leads to Kärnan Tower.

The Krooksha-Plantering, or new portion of the town, is southward of the older part, and contains the numerous factories; there are electric trams in the streets, and the town has a botanic garden, also mineral springs containing iodides and bromides. The population was 33,843 in 1914.

Communication.—There are daily steamers to Helsingör and three times weekly to Copenhagen, also a steam ferry to Helsingör.

There are lines of railway to Göteborg, Jönköping, and Landskrona, the central station being southward of the market, and that for Göteborg at the steam-ferry landing place. The post and telegraph offices are at the harbor, near the customhouse, and there are telephones.

Coal and supplies.—About 9,000 tons of coal are kept in stock, and 80,000 tons are imported annually. Coaling is carried on by baskets, and a coal wharf, 700 feet in length, has a depth of 22 feet alongside; about 340 tons could be put on board in 24 hours, but coaling in the road might be impeded by a northwest gale.

Fresh provisions may be obtained, and water from water boats.

Dock.—There is a drydock with following dimensions: Length, on blocks, 275 feet; on sill, 276 feet; breadth at entrance, 44½ feet, and depth on sill, 16 feet.

Repairs can be effected at the dock and some machine shops, and cranes on the quays will lift 30 and 11 tons.

Trade.—There is a superphosphate establishment where copper is worked, also margarine, india rubber, railway carriage-building factories, and breweries. The principal exports are wood and clay goods, and the imports are coal, coke, and manure.

Danish Shore.—In entering the sound from the northward the light green slopes and beech woods of the Danish Shore contrast strongly with the high and dark appearance of the Swedish Hills.

Gilbjerg Head, a steep bare cliff, 109 feet high, with a conspicuous square building just eastward of its highest point, has been already mentioned and eastward of it the land lowers toward Gilleleje fishing village, which may be known by its church, with a black sharp spire, situated 1¼ miles east by south of Gilbjerg Head; from Gilleleje the coast trends in the same direction, and for a similar distance to Nakke Head.

Dangers.—The 10-fathoms contour line, which passes about 3¾ miles northward of Gilbjerg Head trends in an east-southeast direction, gradually closing the shore, and is only 1½ miles off Nakke Head. Vessels of deep draft should not approach this coast inside a depth of 7 fathoms.

Gilleleje Flat, composed of sand with black specks, rock, and shingle, extends for a distance of 2 miles northward of Gilleleje to the 5-fathoms contour line, and has general depths of from 3¼ to 5 fathoms over it, and several shoaler spots.

Ostindiefarer Ground, the northernmost of these shoals, is 1¼ miles northward of Gilleleje, and has 2¼ fathoms water over it.

Smidstrup Ground and Bavnehöj Ground are two patches with depths of 2¼ fathoms over them, lying, respectively, southeastward and southward of Ostindiefarer Ground. All three shoals have large rocks on them.

Vesterlands Ground, situated to the southward of Ostindiefarer Ground, and ½ mile off the coast, has a least depth of 1¼ fathoms over it, with a shoal of 1½ fathoms between it and the shore; about ¼ mile east-southeast and the same distance northeast of Vesterlands Ground, are patches of 2 and 3 fathoms, respectively.

Söborghoved Ground with a depth of 1½ fathoms over it, lies 1 mile eastward of Vesterlands Ground, and the same distance from the coast.

Light-and-whistlebuoy.—The north edge of the 5-fathoms contour line, surrounding Gilleleje Flat, is marked by a red buoy, marked "Gilleleje Flak," which exhibits an occulting white light, showing light for five seconds, and eclipse two and a half seconds; a whistle is also sounded from the buoy. Replaced when ice renders it necessary by a red spar buoy.

Buoys.—A red conical buoy, surmounted by two upturned brooms, is moored in 7 fathoms water, 400 yards northward of Ostindiefarer Ground.

A red conical buoy, surmounted by an upturned broom, is moored in 4½ fathoms water 1 cable northward of Söborghoved Ground.

Clearing mark.—Bilstrup Church, open westward of Smedstrup Village, bearing 213°, leads westward of the dangers of Gilleleje Flat.

Gilleleje Harbor is formed by a northern breakwater, about 800 feet in length, in a north-northeast direction, with a short arm which extends in an easterly direction from the shore. About 300 yards southward of it, and southward of this arm, is a basin, protected from the eastward by a breakwater which has a northerly direction for about 430 feet, the entrance, facing eastward, being 50 feet in width; the space to the northward is open to the eastward.

Lights.—On the north breakwater head a fixed green light is exhibited, at an elevation of 20 feet above sea level, from a cylindrical gray house, 13 feet in height.

At the extreme of the short arm, on the north side of the entrance to the harbor, a fixed light, with white and green sectors, is exhibited, at an elevation of 14 feet above sea level, from a post; it shows green seaward and white over the harbor.

Depths.—The harbor, which has a depth of 1½ fathoms, is approached by a channel, in which there is 2 fathoms, but a northwest gale may raise the water about 6 feet, while a gale from the opposite quarter may lower it about 5 feet.

A strong current sometimes sets in and out of the harbor.

Buoy.—A white can buoy, surmounted by a down-turned broom, is moored on the east side of the entrance channel, and 200 yards from the harbor entrance.

Anchorage is prohibited in the entrance to the harbor.

Town.—Gilleleje is a town with a population of about 1,100.

Communication.—There is a railway station at the harbor and post and telegraph offices in the town.

Supplies.—Some coal might be obtained, and fresh provisions can be procured; the water supply is near the harbor, and also an ice house.

Slip.—There is a patent slip with lifting power of 30 tons.

Nakke Head, a slight protrusion of the coast, is a cliff covered with bushes, and has on it the old and new lighthouses.

Light.—On the summit of Nakke Head a square white tower, 69 feet in height, with narrow red stripes, exhibits, at an elevation of 177 feet above sea level, a group flashing white light, visible 19 miles. (For sectors, see Light List.)

The disused tower, of similar shape, is situated about 400 yards eastward of the above.

Coast.—From Nakke Head the coast trends east-southeast, for a distance of 5½ miles, to Ellekilde Hook, and then turns to the southeastward for nearly a similar distance to Kronborg.

The most conspicuous objects on this coast are Dronninge Mill, situated to the westward of Villingebæk fishing village; Hornbæk fishing village, the church of which has a black, sharp spire; Elle-

borg house; Odinshöj, with Nordskov Mill close to it; Hellebæk cloth factory, which has a high red chimney; Marienlyst marine hotel; and, lastly, Kronborg Castle, with three spires.

Depths offshore.—The 5 and 10 fathom lines, which are close together at about 1½ miles northeastward of Nakke Head, gradually close the shore, and off Ellekilde Hook are ⅓ and ¾ mile, respectively, from it, but between Hellebæk and Kronborg both contour lines have again drawn offshore and are 1¼ miles from it surrounding Lappe Ground.

Outside the shore bank, between Nakke Head and Hornbæk, is a vein of deep water about ½ mile wide, known as Dybe Channel, which has depths of from 14 to 15½ fathoms, or from 1 to 2 fathoms more than the general depth outside it; the bottom is clay. If soundings are obtained in this vein it affords useful information regarding a vessel's position, as the water shoals quickly to 5 and 3 fathoms inside it toward the Danish side.

Dangers.—Fleskerevet, a rocky shoal about 200 yards in extent, lies ½ mile eastward of Nakke Head new lighthouse; it has a depth of ½ fathom over it, with a narrow channel, in which there is 1 fathom water between it and the shore.

Klidderet, lying ½ mile from the coast, between Dronninge Mill and Villingebæk, is a heap of stones, with 1½ fathoms water over it, and a channel with a depth of 2¼ fathoms between it and the land.

Villingebæk Pier and fishing village of the same name, are southward of Klidderet; the pier is 920 feet in length in a northerly direction, with depths of from 9 to 10 feet near its outer end, but northwest winds raise the water 3 feet, and those from southeast lower it 2 feet. A shoal, with a depth of 1¼ fathoms, lies northward of the pierhead.

Communication.—The post, telegraph, and telephone offices are at Hornbæk.

Supplies of fresh provisions and water can be procured.

Hornbæk Bay, situated eastward of Villingebæk, affords anchorage to vessels prevented by the current from entering the Sound, but large vessels should not go into less than 6 or 7 fathoms water, and a good berth for these is in from 12 to 14 fathoms, with Kronborg Point in line with Ellekilde Hook 131°.

Shoal.—A shoal, with a depth of ½ fathom over it, lies about ¼ mile off the shore of the bay.

Hornbæk Boat Harbor, eastward of Hornbæk Bay, has two breakwaters; the western, about 500 feet in length, extending in a northerly direction for the first half and then northeast for the remainder of this distance; from the seaward side of the angle of this breakwater there is an extension 160 feet in length in a north-northwest direction.

The eastern breakwater is about 300 feet long in a northerly direction, and the entrance between the heads is 40 feet wide. The depth in the harbor is from 7 to 10 feet, but northwest winds raise the water 4 feet, and those from southeast lower it 3 feet; it is approached by a channel with a depth of 10 feet.

Lights.—From a pole 8 feet in height on the inner west breakwater head, a fixed white and green light is exhibited at an elevation of 14 feet above high water, showing green to seaward and white over the harbor; it is shown from September 1 to May 15.

From a black post, 11 feet in height, on the end of the northern extension, a fixed green light is shown at an elevation of 14 feet between September 1 and May 15; with onshore winds it may be impossible to light it. (For sectors, see Light List.)

Tides.—It is high water, full and change, in Hornbæk at 8h. 36m.

Communication.—There is a light railway to Helsingör, and post, telegraph, and telephone offices in the town, which latter has a population of about 800.

Supplies.—Fresh provisions are plentiful, and water can be obtained from the waterworks.

Hellebæk.—The pier near Hellebæk extends from the fishing village of Aalsgaard in a north-northeast direction for a distance of 560 feet, and has a depth of about 7 feet at its outer end, off which is a shoal with 5 feet water over it. The cloth factory at Hellebæk, used as a leading mark, has been already mentioned. Hellebæk Village has a population of about 800.

Lappe Ground, a sandy shoal, extends for nearly 1¾ miles in a north-northwest direction parallel to and about ¾ mile off the coast. The depths over it, which are uneven, are not less than 2 fathoms, except near the middle, where the sunken ruins of an old blockhouse form a patch on which the depth is 1 fathom. On the eastern side the shoal is fairly steep-to.

Two shoals, with depths of 2¾ and 3 fathoms over them, lie about 400 and 1,000 yards, respectively, northwestward of the northern extermity of Lappe Ground.

Lightvessel.—A lightvessel, painted and masted in accordance with the Danish system, is moored in a depth of 14 fathoms, 1¾ miles northward of Kronborg Lighthouse, and exhibits, at an elevation of 31 feet above sea level, a flashing white group light, visible 10 miles.

When the lightvessel is not in position a fixed red light is shown from Kronborg Battery and should be seen from a distance of 9 miles; it is in line with Kronborg Light bearing 191°, which leads eastward of Lappe Ground.

Blasts on the siren will be sounded in the event of the probability of the lightvessel being fouled by passing vessels.

Fog signal.—During thick or foggy weather a fog siren gives two blasts each of two seconds in quick succession every minute.

Ice signals.—The lightvessel will signal the condition of the ice in the Danish channels, and in the German harbors in the Baltic if requested to do so by passing vessels.

Buoys.—Lappe Ground is marked by five buoys, as follows:

On the north side by a red conical buoy surmounted by an upturned broom and moored in a depth of 7 fathoms.

On the northeast side by a red conical buoy surmounted by three upturned brooms in 6 fathoms water.

On the west side by a red conical buoy in 4½ fathoms water.

On the south side by a red conical buoy surmounted by two upturned brooms moored in a depth of 4½ fathoms.

A white can buoy surmounted by a down-turned broom marks the northwestern side of the 1-fathom patch.

Pilots.—The lightvessel is a pilot station, and should one be taken for Helsingör the pilotage charge is the same as if the pilot is obtained off that harbor.

Anchorage.—Lappe Ground is separated from Kronborg Point by a 2½-fathom channel, in which small vessels find temporary anchorage.

Current.—With northwest by west winds the current almost invariably sets south east by south, but with southwest by south winds its direction is somewhat uncertain, but more frequently it is southeast by south than northwest by west.

Kronborg Point, which is easily recognized by Kronborg castle standing about 200 yards westward of its extreme, is very steep-to, the 10-fathom contour line passing about 100 yards outside it.

Lights.—From the northeast tower of Kronborg castle, which is 103 feet in height, an alternating white and red light is exhibited at an elevation of 111 feet above high water, visible 15 miles.

A fixed red light, shown at an elevation of 20 feet above high water, from a small iron frame on Kronborg Battery and visible in clear weather from a distance of 9 miles, is a signal that Lappe Ground lightvessel is not in position.

Fog signal.—During thick or foggy weather a siren, worked by hand, gives three blasts every minute with high and low notes, thus: High note, 1 second; silence, 3 seconds; low note, 2 seconds; silence, 3 seconds; low note, 2 seconds; silence 49 seconds. (See Light List.)

Signal station.—Kronborg Point is a State signal and telegraph station and vessels can communicate with it by the International Code, the flagstaff being on the point.

Storm signals.—Storm signals are made from Kronborg castle tower, and additional storm signals are also shown. (See Chapter I.)

Submarine telephone cable.—A telephone cable crosses the sound from a cable house northward of Kronborg Point to the

Swedish shore southward of Pålsjö, and is marked on the Danish side by telegraph beacons. (See Chapter I.)

Submarine cables.—Two submarine telegraph cables have been laid from a point about 1 mile northward, from Kronborg Point in a 62° direction to the Swedish coast northward of Helsingborg. The northern cable is marked on each coast by two white beacons, each with a white diamond-shaped topmark, which in line point out the direction of the cable. An occulting green light every four seconds (light two seconds, eclipse two seconds) is shown from each beacon.

Mariners are warned against anchoring on the routes of these cables.

Directions.—In clear weather the approach to The Sound from the Kattegat offers no difficulty, as the Kullen on the Swedish, and the land about Nakke Head on the Danish shore, are unmistakable guides. The lights on those places are also good guides by night, but it should be remembered that even in clear weather, the high light at the Kullen has been obscured by clouds. In approaching from the north, care must be taken not to be set to the eastward by the current either into Skelder vik, or in too close proximity to the outlying shoals between Lerhamn and Kulla Gunnarstorp.

In thick weather, this caution is particularly necessary, and with a view to ascertaining the vessel's position by the Dybe Channal the Danish shore might be kept, but neither side should be approached in thick weather to a less depth from 10 fathoms, observing that the bottom under this depth on the Swedish side consists of coarse sand, while on the Danish shore the bottom is fine sand. When sure of being southeastward of Hittarps Reef, the Swedish shore may be approached to a depth of 6 fathoms.

Steam vessels, and those under sail with a fair wind, should pass Kullen at distances of from 2 to 3 miles, and steer about 106°, keeping in mid-channel until Nakke Head bears about 262°, when the course may be slightly to the eastward; but Nakke Head should not be shut in by Ellekilde Hook until Hven is well open of Kronborg Point, bearing about south.

The following are clearing marks for the several shoals mentioned on the Swedish coast:

East Högkullen open westward of Lerhamn, bearing 14°, leads westward of the shoals northwest of Höganäs.

Kulla Gunnarstorp mill in line with the point westward of Viken, bearing 138°, leads southwest of the shoals southward of Höganäs.

Kulla Gunnarstorp mill in line with Gnetaröd mansion house, bearing 127°, leads southwest of Svinbådan.

East Högkullen in line with the point westward of Viken, bearing 351°, leads westward of Grolle Ground and the shoals southeast of it.

With a westerly wind a sailing vessel should keep on the Danish side, with Kronborg Point in line with the east point of Odinshöj, bearing 31°, and when Nakke Head bears about 264°, steer about 118° for Kärnan Tower, passing northeastward of Lappe Ground lightvessel, when the northwest point of Hven should be well open of Kronborg Point, bearing about 171°.

Small vessels can pass along the Danish coast, southward of Vesterlands Ground, and northward of Fleskerev and Klidderet, in a depth of 3 fathoms, by keeping Kärnan tower in line with Ellekilde Hook, bearing 110°.

Small vessels can also pass to the westward of Lappe Ground by keeping Kronborg highest and southernmost spire just open of, and with the lower part just touching, the northernmost spire, bearing about 151°, and Hellebæk cloth factory chimney kept midway between Nordskov Mill and Odinshöj, about 303°, leads southward of Lappe Ground.

By night, when northward of Svinbådan Lightvessel, do not approach the Swedish shore eastward of the line joining that lightvessel and the Kullen Light, and having passed Svinbådan Lightvessel, it may be kept in line with Kullen Light bearing 345° until Nakke Head bears 264°, when steer about 140° to pass midway between Kronborg and Helsingborg Lights, observing that Nakke Head Light is not shut in by Ellekilde Hook until Hven northwest point light is well open of Kronborg Point, bearing about 171°.

Sailing vessels, with an easterly wind, should keep over toward the Swedish side.

Directions southward of Kronborg Point, see below.

Disken is a bank about 2¼ miles in length in a north and south direction, and 1,200 yards in breadth, within the 5-fathom contour line, its northern end being about 1 mile southward of Kronborg Point; it is composed of white sand and stones, and has general depths of 4 fathoms over it, with one spot of 3¾ fathoms just southward of its center.

Helsingör Channel, the space between the east side of Disken and the Danish coast, affords anchorage for a considerable number of vessels, and during north and northwest winds, in the spring and autumn, it is sometimes crowded; in choosing a berth some difficulty may be experienced to avoid collision, and in the event of such happening the vessel which causes the collision is liable in damages to the vessel at anchor.

In the space between the north end of Disken and the coast from Helsingör to Snekkersten, the holding ground is not good, owing to the soft bottom, but otherwise anchorage may be taken up in any part of the road, the best berth being on Disken, in a depth of from 4 to

5 fathoms, over good holding ground, and with West Högkullen slightly open of Kronborg Point, bearing about 343°.

Coming from the northward in a northwest gale, although advisable to keep close round Kronborg Point, a sailing vessel should be prepared for squalls, which, with the wind westward of northwest by west, come off the land, southward of that point; with these winds there is perfectly sheltered anchorage in the bend of the coast, between Snekkersten and Humlebæk, in from 6 to 8 fathoms, good holding ground.

The holding ground is good between Disken and Kronborg Point, also eastward of Disken, where anchorage may be obtained in from 10 to 12 fathoms, but exposed to north and northwest winds, which sometimes blow hard during summer, but southerly winds, with a strong north-going current, are the worst in the road, as they raise a heavy sea.

Helsingör Harbor, which is a convenient place of call for vessels proceeding to the Baltic, consists of north, west, and south harbors, and has a mole, extending for a distance of about 800 feet, in a southwest direction, from its east side, outside which is a breakwater, nearly 1,000 feet in length in an easterly direction, with an entrance, facing eastward, between the heads 230 feet in width; the area of the three harbors is 18 acres.

The wharves and quays are of wood, and have depths of from 22 to 24 feet alongside, with rails leading to the railway station; they are lit by gas.

Light.—A fixed red light is exhibited, at an elevation of 23 feet above high water, from a conical white iron tower, 17 feet in height, situated on the outer breakwater head; it is visible 3 miles.

A fixed white light is shown at the railway station, and white, red, and green lights at the ferry landing.

Fog signal.—During thick or foggy weather, a fog bell is struck every two seconds.

Leading lights.—Two fixed green leading lights are situated in the southwest part of the south harbor, and when in line, bearing 247°, lead southward of the shoal extending from Kron Head and the mole west of it, and in the dredged channel into the harbor.

Depths.—The entrance channel is dredged to a depth of 26 feet, and the greater part of the south harbor has the same depth; the channel generally retains its depth, and dredging is almost unnecessary. In the north harbor there is from 21 to 25 feet, and in the west harbor about 20 feet. Winds from west by north to north by west raise, and gales between east by south and south by east lower, the water in the harbor.

Lloyd's signal station.—Vessels can communicate with a Lloyd's signal station by the International Code.

Wind, ice, and lightvessel signals are made from the pilot's house, which is also the health office, and is situated on the South breakwater; for these signals, see Chapter I.

Harbor signals.—A black ball, hoisted at the flagstaff by day, and a fixed red light shown under the breakwater red light by night, indicate that the harbor is closed to vessels, and two black balls, by day, or a fixed red light under the white light, showing only in the direction of the North Mole, denote that vessels can not leave the harbor.

Icebreakers.—There is one regular icebreaker, and the steam ferryboats running between Helsingör and Helsingborg are also used to keep the channel open.

Quarantine regulations.—Landing is prohibited from vessels before pratique is given, except at the health office, on the breakwater, where every vessel must be reported, but if requested a ferryboat will convey letters and vessel's papers to the health office and to consuls or agents.

Observation quarantine, only of a few days' duration, is performed in Helsingör Roadstead, but vessels from infected ports, with cargo to discharge, may be ordered to Kyholm, on the east coast of Samsö.

Tugs.—There are two tugs and a salvage steamer.

Pilots for the harbor may be obtained off the entrance or from Lappe Ground Lightvessel.

The Helsingör pilots undertake uninterrupted pilotage from the Skaw, through the Kattegat, and the sound to Falsterbo and Bornholm, and vice versa; from the sound north of Zealand through the Great Belt to Albuen, Gjedser, and Bornholm; along the west coast of Jutland from the Skaw to Horn Reefs or Graa Deep Bar; and also from the Sound to Kallundborg, Halskov (Korsör), and Knuds Head (Nyborg).

Directions.—A mill on high ground, southward of the town, just open northward of the large railway station with two towers in the southwest part of the harbor bearing about 247°, leads southward of the shoal water extending southward of Kron Head and that southward of the East Mole, but care is necessary not to bring the mill further north than to be in line with the flagstaff on the lower customhouse, which is painted red, and the helm requires careful attention.

The breakwater head, which is whitewashed, should be rounded somewhat closely, and a sailing vessel should not reduce sail too soon, but keep sufficient way to clear the shoals on the north side, on which the current might set an unmanageable vessel. Within the entrance sail must be quickly shortened, with an anchor ready for letting go, and the harbor authorities will assist with warps, etc.

By night the fixed green lights in line, bearing 247°, clear the shoals on the north side, and lead into the harbor.

Currents.—When there is a strong northerly current, an eddy between Kron Head and the entrance might set a vessel toward the south side and on to the breakwater head, and with a strong southerly current the set might be toward the north, and on to the molehead.

Ice.—Average ice conditions, see Appendix.

Town.—Helsingör is a commercial town, with narrow streets and houses crowded together, and had a population of 14,500 in 1914.

Kronborg castle, built between 1574 and 1585, is the most perfect specimen of Renaissance castellated architecture remaining in Scandinavia, its massive walls, fosses, and escarpments being kept in a good state of preservation.

Communication.—A steam ferry to Helsingborg crosses the sound from Helsingör nine times daily, the time occupied being about 20 minutes. A railway connects the town with Fredericksborg, and a light railway runs to the sea-bathing places Marienlyst, Hellebæk, Aalsgaarde, and Hornbæk, the latter distant about 8 miles. Ferrymen furnish boat connection between the harbor and vessels anchored in the road, the fare being fixed and moderate.

A post and telegraph office is in the harbor.

Coal and supplies.—About 4,500 tons of coal are stocked, and 43,916 tons were imported in 1909; vessels can coal at anchor or alongside, the coal wharves being from 300 to 500 feet in length.

Fresh provisions are plentiful and water can be obtained from the waterworks, being laid on to the quays; it is also supplied in motorboats, and can be used in small tube boilers.

Repairs.—Every kind of repair can be executed; a steam crane will lift 80 tons, steam sheers 45 tons, and there are smaller cranes lifting 10 and 4 tons, respectively.

Docks and patent slip.—

Name of dock.	Length.		Breadth at entrance.	Depth.		Lifting power.	Date built
	On blocks.	Over sill.		On sill.	On blocks.		
No. 1 Dock	320	334	43	14	13½	.....	1883
No. 2 Dock	361	367	57	18	16	.....	.....
Patent Slip	214 (cradle).	.....	22 (cradle).	Forward.	8	750	1863
				Aft	18		

Time signal.—The time signal, made from the signal mast, 40 feet in height and 46 feet above the water, on the pilot house, consists of a ball hoisted halfway up at 5 minutes before the signal, close up at 2 minutes before, and dropped at Greenwich mean

noon, corresponding to 1h. p. m. mid-European standard time, used throughout Denmark. Chronometers may also be compared at the telegraph office. (See Chapter I.)

Trade.—The principal exports are foodstuffs, coal, hides, and skins, scrap iron and rags, and imports coal and coke, fresh fish, butter, eggs, manufactured goods, fire bricks, cement, etc.

The manufactures consist of shipbuilding and the manufacture of fishing nets, beer, vinegar, brush heads, staves, and butter casks; there are sawmills, an iron foundry, and a mechanical joinery.

Coast.—From Helsingör the coast trends in a south-southwest direction for nearly 2 miles, and then bends a little more westerly for 5½ miles to Nivaa, from which it turns to the southward for about a similar distance to Vedbæk; it is wooded in many places, with several houses near the beach.

The most conspicuous objects are the fishing villages of Snekkersten, Skotterup, and Espergjærde, the latter with a church; Tibberup Mill, Humlebæk Church with a sharp spire, the very tall chimney of works at Nivaa, and farther south Rungsted and Vedbæk.

Depths offshore.—Between Helsingör and Snekkersten the shore bank is narrow and steep-to, but southward of the latter the 5-fathom contour line begins to draw offshore, and trends due south across the bight formed by the coast, passing 2½ miles eastward of Nivaa and inclosing Nivaa Flat.

Caution.—Between the months of September and November, inclusive, fishing areas are reserved on the coast between Helsingör and Rungsted, these spaces being marked on the eastern side by poles with green flags and on the western side by poles with red flags; the area is within the 7-fathom contour line.

Vessels are cautioned that navigation over and anchorage on this area is prohibited, also that steamers should not approach the buoys too closely. When northward of Humlebæk anchorage is not permitted westward of the line of Helsingör Harbor and Kronborg Point Lights in one, bearing about 25°.

Snekkersten is a small harbor formed by a north breakwater, extending in a southeast direction for about 300 feet, and another to the southward, parallel to it, 400 feet, with a bend 250 feet in length to the northeast; the entrance between the two heads, facing northeast, being 60 feet in width.

The depth in the entrance is 1½ fathoms, and in the harbor 1½ fathoms, but gales from the northward raise the water 3 feet and those from the southeast lower it about the same amount.

Light.—A fixed red light is exhibited, at an elevation of 16 feet above high water, from a post on the south breakwater head; it is shown from August 15 to May 15.

Communication.—Snekkersten is a station on the railway between Helsingör, Frederiksborg, and Copenhagen. The post station is at Helsingör, but letters are collected, and there is a telegraph and telephone.

Supplies.—Fresh provisions can be procured, and water from a well.

Espergjærde, 1¼ miles southwestward of Snekkersten, is a boat harbor with two breakwaters, the northern extending about 150 feet to the eastward and the same distance southeast; the southern has an east-southeast direction for 150 feet, and then northeast for about the same distance, the entrance between the heads, facing northeast, being about 50 feet in width.

The depth in dredged channel is 1½ fathoms, and in the harbor 1¼ fathoms, but northerly winds raise the water 4 feet, and those from south and east lower it 3 feet.

Light.—A fixed red light, elevated 11 feet, is exhibited from a white octagonal lighthouse on the head of the south mole. Shown from August 1 to April 1 annually.

Buoys.—A red spar buoy, surmounted by a broom, and a white spar buoy, surmounted by a straw wisp, are on the north and south sides, respectively, of the dredged channel.

Humlebæk, about 1½ miles southwest of Espergjærde, is another boat harbor, with a northern breakwater, about 330 feet in length, in an east-southeast and northeast direction, outside which a southern breakwater extends in a northeast direction for about 500 feet, the entrance between the heads being about 40 feet. The depth in the entrance is 1¼ fathoms and inside 1½ fathoms, but northerly gales raise and those from southeast to south lower the water about 3 feet.

Dangers.—A shoal, on which the depth is 2½ fathoms, caused by a wreck, lies ½ mile northeastward of the harbor.

Outside Humlebæk, and ⅜ mile offshore, a shoal on which the depths are 3½ fathoms with 4½ fathoms between, stretches southward for 1 mile.

Current.—The north-going current sometimes runs close to the land about Humlebæk, and at other times it may be a mile off, and if the set toward Snekkersten is strong it causes a counter current which runs to the southward close inshore.

Communication.—Humlebæk is a station on the railway between Helsingör and Copenhagen, and there are post, telegraph, and telephone offices.

Supplies.—Fresh provisions can be obtained, and water from a well in the town.

Sletten, 1¼ miles south-southwest of Humlebæk, is a boat harbor with a north and south breakwater, the former extending about 300

feet east-southeast, and the latter first that distance in the same direction, and then turning northeast for a similar distance; the width of the entrance, which faces northeast, is about 45 feet.

The depth in the entrance is 1½ fathoms, and in the harbor 1¼ fathoms, but northwest winds raise and those from southeast lower the water 2 feet.

Light.—From a pole on the south breakwater head a fixed light, with white and red sectors, is exhibited at an elevation of 14 feet above high water, from September 1 to March 31.

Communication.—The nearest railway station is at Humlebæk, where are also the post and telegraph offices, but letters are collected, and there is a telephone near the harbor.

Supplies.—Fresh provisions and water can be procured.

Nivaa is situated 1½ miles south-southwest of Sletten, and about 1 mile from the latter are Niverod and Sölyst piers, the former 755 feet in length, with a depth of 1¾ fathoms at its head, and the latter, 1,247 feet in length, with a similar depth.

Nivaagaard Pier is similar, both in length and depth, to that at Sölyst, and both are connected with the railway station. The water at all these piers is raised about 2 feet by gales from northwest and lowered nearly as much by those from southeast.

Dangers—Nivaa Flat.—The 3-fathom contour line commences to draw offshore abreast Sletters, approaching it again at Rungsted, and abreast of Nivaa it is nearly 1½ miles off the coast; the bank so formed, known as Nivaa Flat, has general depths of from 1¼ to 2¾ fathoms.

In a bight of the shore bank southward of Nivaa Flat are three patches, each of 3 fathoms.

Anchorage.—The best anchorage off Nivaa, in depths of from 1¾ to 2½ fathoms, is with the lowest of the southern tile works chimneys in line with the outer end of the southern pier, and 400 to 600 yards from it, but the tile works are not shown on the chart.

Rungsted, about 2¾ miles southward of Nivaa, has a pier extending 1,247 feet in an east-northeast direction, with a depth of 1¾ fathoms, and there are two other piers between the places.

Lights.—Three fixed red and green lights are shown from Rungsted piers when steamers are expected.

Vedbæk, nearly 2½ miles southward of Rungsted, has a pier 460 feet in length, with a depth of 10 feet; the population of the village is about 800.

Lights.—From the rear white and red telegraph beacon, 49 feet in height, and surmounted by a red disk and a white diamond, a fixed red light is exhibited, at an elevation of 56 feet above high water, and should be visible in clear weather from a distance of 9

miles, and below it, at an elevation of 39 feet above high water, is a fixed white light, which in clear weather should be visible from a distance of 12 miles.

From the cable house, painted white, with a red disk on the roof, a fixed red light is exhibited, at an elevation of 26 feet above high water, and should be visible, in clear weather, from a distance of 9 miles.

The lights are in line, bearing 244° and 137 yards apart, and show 10° on either side of this line. In line they show direction of the submarine cable.

Two fixed red and one green lights are shown from Vedbæk pierhead when a steamer is expected.

Submarine telegraph cable.—A telegraph cable crosses the sound from Vedbæk to Hildesborg, passing southward of Hven, and is marked by two beacons on the Danish side. (See Chapter I.) Vessels are prohibited from anchoring near the line of the cable.

Measured mile—Beacons.—Near Vedbæk are two pairs of measured mile beacons, surmounted by balls, the northern pair are immediately north of the town, and the southern pair near Aggershvile, to the southward. Each pair are in line, bearing 253°, and a course at right angles to this gives 1 nautical mile.

Anchorage may be obtained off Vedbæk, in a depth of 6 fathoms, ⅔ mile from the shore, with Nyholm old crane in line with Taarbæk Point, bearing 177°, or at ½ mile offshore in 5 fathoms, with Trekroner Battery in line with the same point, 172°.

Lous Flat, about 5½ miles in length, with a greatest breadth of 2 miles and irregular in shape has its northern end 1¼ miles eastward of Rungsted Pier; at the northern end its western edge is about 1 mile offshore, and its south extreme is 3¾ miles southeast of Vedbæk, and 2½ miles offshore.

The depths on the flat are from 4 to 5 fathoms, and it is separated from the shore bank by a channel, which is about ¼ mile in width at its narrowest part, and has depths of from 6 to 7 fathoms. The bottom of the flat, which is uneven, is of hard sand.

A patch, with a depth of 4¼ fathoms, lies ½ mile east-northeast of its north end.

Clearing marks.—The south point of Hven, bearing 108°, with Landskrona Church, having two towers, just shut in, leads north.

Kronborg Point touching the northwest point of Hven, bearing 350°, leads eastward.

Frelser Church spire (Copenhagen) in line with Nyholm Crane, bearing 204°, leads southeast.

By night.—Kronborg Point Light, just open westward of Hveh Northwest Light, bearing 350°, leads eastward of Lous Flak.

Swedish shore.—From Helsingborg the coast trends to the south-southeastward for a distance of about 11 miles to Landskrona and continues hilly and without trees, but immediately south of Helsingborg and also close to the northward of Landskrona it has a low fore shore.

The shore bank is in general steep and rocky, and between Helsingborg and the fishing village of Råå the white bottom shows plainly in a depth of 2 fathoms.

About 1¾ miles southward of Helsingborg are some copper works with three high chimneys and one smaller one, all close together; the tallest chimney is very conspicuous.

Beacon—Caution.—Westward of the copper works is a beacon consisting of a white post with a triangular top mark, point upward, and another beacon 425 feet 95° from the above consists of a white post with triangle, point downward, as top mark. These beacons, which have an elevation of 33 and 39 feet, respectively, in line point out the direction of the outlet pipe, which extends 700 yards seaward of the beacon, and vessels should not anchor in the vicinity of the pipe.

Knähaken.—About 2 miles southward of Helsingborg the shore bank forms an angle, turning to the eastward for a mile to Råå, and outside it is Knähaken, a sandy spit, which, with about 2 fathoms on its outer part, extends nearly ½ mile offshore.

Buoy.—A red spar buoy, surmounted by a down-turned broom, marks the western side of the elbow of Knähaken.

Råå Hamn, situated in a slight bight about 3 miles southward of Helsingborg and at the mouth of a small river of the same name, is formed by two piers extending in a southward direction, the northern and longer having a bend to the southward at its extreme; it has about 1,300 feet of quay, with the same depth as in the outer part of the harbor.

Light.—On the north pierhead a hexagonal-shaped white wooden house, 21 feet in height, exhibits, at an elevation of 22 feet above sea level, an occulting light, with white, red, and green sectors, visible, respectively, 7, 5, and 4 miles, and if anything interferes with it being lighted two fixed red leading lights will be shown. (For sectors, see Light List.)

Depths.—The depths are from about 16 feet in the outer part to 7¾ further in, but they may be 2 feet less with strong southwest winds.

Anchorage.—Råå Roadstead affords anchorage in depths of from 7½ to 10 fathoms, over clay, large vessels anchoring with Kärnan tower just open westward of the copper works, bearing about 344°, and small vessels with the same tower just open eastward of them.

By night, large vessels should anchor with half of Helsingborg lights obscured by the land about Knähaken, and small vessels with all the lights just shut in.

Pilots may be obtained during the daytime.

Storm warnings are posted up at Råå. (See Chapter I.)

Communication.—Råå is a post and telegraph station, and there is a railway station on the line to Helsingborg, at Raus; telephonic communication with the coast-guard station.

Supplies of fresh provisions, ships' stores, and water in any quantity may be obtained.

Repairs.—There is a workshop where some repairs could be executed.

Trade.—The chief export is copper, and imports are coal, rock salt, and copper pyrites.

Coast.—From Råå the coast trends to the southward, for 3½ miles, to Ålabodarne, and the shore bank, which off the former place was only distant about ½ cable, increases to nearly 4 cables from the coast at Öfre Glumslöf.

Buoy.—The western edge of the shore bank, abreast of Öfre Glumslöf, and about 1 mile northwest of Ålabodarne, is marked by a large spar buoy, surmounted by a down-turned broom.

Ålabodarne, a fishing village and small harbor, has two piers built in a semicircle, the northern being the longer of the two: there are about 1,150 feet of quay.

Light.—From a post on the north pierhead, a fixed light, with white, red, and green sectors is exhibited, and is visible 3 miles. (For sectors, see Light List.)

Depth.—The depth in the harbor at low water is about 6 feet.

Coast.—From Ålabodarne to Landskrona, a distance of 4½ miles in a southerly direction, the shore bank gradually draws off the coast until abreast the latter place it is distant from it about ¾ mile.

Glumslöf Church, a mile eastward of Ålabodarne, stands on very high ground and has a square tower, and about 1½ miles southward of it are Hildesborg white beacons, which are in line, bearing 64°, and mark the line of the telegraph cable to Vedbæk.

A dark tower, situated to the eastward of Landskrona, is also conspicuous, and there are two very tall chimneys in the town, one being about its center and the other near the northern end. Wadensjo Church, about 3 miles northeastward of the town, has a pointed tower and slate roof.

Shoal.—A shoal, with a depth of 3¾ fathoms, lies 1 mile offshore, with Haken Lighthouse (Hven) bearing 260°, distant 1¾ miles.

Gette Reef, with a depth of 2 feet over it, lies about 600 yards off the coast at ½ mile southward of the telegraph beacons. A large

red spar buoy, surmounted by two down-turned brooms, is moored on the southwest side of Gette Reef and 900 yards from the coast.

Borstahusen, a fishing village, has a harbor formed by two piers extending to the westward, the northern pier having a bend to the southward and the southern a bend to the northwestward at its outer end. There is an outer and an inner harbor, separated by a bridge, and the quay is 2,300 feet in length.

Light.—A small white tower on the north pierhead exhibits, at an elevation of 16 feet above sea level, a fixed light, with white and red sectors. (For sectors, see Light List.)

Depths.—There is a depth of 8½ feet in the outer, and of 5½ feet in the inner harbor.

Communication.—There are post, telegraph, and telephone offices; the nearest railway is at Landskrona, distant about 2 miles.

Supplies of provisions may be procured.

Storm warnings are posted on a notice board.

Trade.—The exports are beet-root sugar and feeding stuff, and imports, beet-root sugar and limestone.

Landskrona, a natural harbor, formed between shoals or flats which extend 2 miles westward and about 3 miles southward of it, is situated at a point where the coast alters its southerly direction, and turns to the east-southeastward.

There is a small artificial basin about 760 yards in length, with a depth of 21 feet at low water.

Norrahaken, the shore bank which extends about ¾ mile westward of the point, forms the eastern and northern sides of the harbor, and has depths of under 2 fathoms over it.

Väster-flacket, about 2¼ miles in length, in a north and south direction, has general depths of from 2¼ to 2¾ fathoms, but near its northern end is Pilhaken, a patch with 1¼ fathoms least water, which, with the northeast side of Väster-flacket, forms the west side of the northern entrance to the harbor.

On the southern part of Väster-flacket is Val Shoal, a shoal patch 1¼ miles in length in a north and south direction, and having depths of ¾ fathom over it; while on the southern extreme of Väster-flacket is Sten Shoal, a patch with a depth of 1¾ fathoms.

Lightbuoys.—A lightbuoy painted red, exhibiting a flashing white light every three seconds, is moored on the western side of the shoal. The buoy is withdrawn annually when the ice sets in. A lightbuoy showing 2 short flashes every 4 seconds is moored northward of Pilhaken.

Buoys.—The western side of Väster-flacket is marked by four red spar buoys; also by a bellbuoy.

The northern and first spar buoy is surmounted by a down-turned broom, over a ball.

The bellbuoy which marks the west side of Pilhaken is surmounted by a down-turned broom, over two balls.

The second spar buoy has a down-turned broom between two balls as a topmark.

The third spar buoy is surmounted by a down-turned broom, under a ball.

The southern and fourth spar buoy, which marks the western side of Stengrund, has a down-turned broom over a ball as a topmark.

Clearing marks.—The northwest point of Hven, open of the southwest point of the same island, bearing 326°, leads southwest, and Kärnan Tower, just open eastward of Haken, the east point of Hven, 354°, leads westward of Väster-flacket.

By night.—Hven Northwest Point flashing white light kept in sight bearing northward of 330°, or Barsebäck white sector of occulting light, eastward of 138°, leads southwestward, and the fixed white sector from Haken Light, between 343° and 355°, leads westward of Väster-flacket.

Skabb Reef, eastward of Väster-flacket, is the shore bank, southward of Landskrona, which extends in a southwest direction from the coast for a distance of 2½ miles, with depths of from ¼ fathom to 2¾ fathoms over it; the vein of deeper water, of which Landskrona Harbor is the outer part, extends in a southeast direction for about 2½ miles into Skabb Reef, and along the western edge of Skabb Reef is the southern channel into Landskrona.

Gråen Fort lies on the north end of Skabb Reef, on the southern side of Landskrona Harbor.

Lights.—In Gräsrännan, on the northwest extreme of Skabb Reef, a white iron house on piles, exhibits, at an elevation of 14 feet above sea level, an unwatched occulting light, with white, red, and green sectors; the white is visible 9 miles, and red 6 miles, and green 5 miles.

Leading lights, shown for entering the harbor, are 235 yards apart, and in line bearing 97°. The front light flashing white, is exhibited at an elevation of 48 feet above sea level, from a lattice-work support, surmounted by a white hexagonal board, situated in the harbor. The rear light is occulting with white and red sectors and shown from a red mast beacon, surmounted by a black hexagonal board, on a hill at an elevation of 92 feet above sea level. It is obscured in places by chimneys. Both lights have a visibility of 9 miles.

Entrances—Depths.—The entrance for large vessels is from the northward, and small vessels can enter through a channel across Väster-flacket or from the southward. The northern entrance has a least depth of 5 fathoms; in the outer part of the harbor the depth

is 4¼ fathoms, at low water, and in the inner part about 22 feet. Vessels of 25 feet draft enter the harbor.

Lightbuoy.—A red lightbuoy, exhibiting a flashing red light every one and one-half seconds, is moored at the southwest edge of Norrahaken.

Buoys—North entrance.—The west side of Norrahaken is marked by a large spar buoy, surmounted by a down-turned broom.

The southwest side of Norrahaken is also marked by a red spar buoy, surmounted by a down-turned broom under a ball, and the south edge of the same shoal has two spar buoys with brooms.

On the western side, the north extreme of Väster-flacket is marked by a black conical buoy, surmounted by a ball.

The western side is also marked by two plain spar buoys, and the southern side by a black spar buoy and two plain spar buoys.

Beacon.—Southward of Gråen Fort is a red pole beacon, 25 feet high, and surmounted by a six-sided blackboard.

Anchorage.—A vessel from the northward, waiting for a pilot, will find convenient anchorage on Staffan Bank, which is nearly 1 mile in length, in a north by east and opposite direction, and about 600 yards in breadth, with depths of from 6 to 8 fathoms over it, and lying nearly midway between Hven and the northwest side of Väster-flacket.

The best berth is in depths of from 6 to 6½ fathoms, over sand, shells, and clay, with St. Olaj Church, Helsingör, in line with Haken, the east point of Hven, bearing 334°, and Pilhakshögen, a small and inconspicuous hill, eastward of Glumslöf, seen between the telegraph beacons at Hildesborg 43°.

Tugs.—Two tugs are available.

Pilots can be obtained.

Directions.—On account of the strong current in the neighborhood of the shoals, it would be advisable for a stranger to take a pilot. Danish submarine vessels may be met with in this locality; see Chapter I.

Coming from the northward and having passed between Hven and the land north of Landskrona, Gräsrännan Lighthouse should be steered for, bearing 170°, passing between the black buoy, with a ball, and the plain spar buoys, on the starboard hand, and the light-buoy and spar buoy (red, with down-turned broom and ball), on the port hand.

Immediately after passing the light buoy, there is a sharp turn to the eastward to bring the two leading light beacons (hexagonal top marks, front white, rear black) in line, bearing 97°, which course leads up the harbor to the entrance to the basin, between the buoys marking the edge of the shoals on both sides.

In thick weather the deep trench, with depths of from 21 to 31 fathoms, which extends for about 2 miles in a north-northwest and opposite direction, between the northwest side of Väster-flacket and Hven, may be of assistance to a vessel making the harbor.

By night.—The southern limit of the sector of white light from Borstahusen, bearing 44°, leads northwest, and the eastern limit of the fixed light from Haken (Hven), 343°, leads westward of Väster-flacket; the white sector from Gräsrännan Light, 170°, leads down the channel until the leading lights (front green, rear red) come in line, bearing 97°, which leads up the harbor, but owing to the sharp turn, the helm will require to be put over in time to bring the lights in line.

Western entrance—Depths.—There is a channel for small vessels across Väster-flacket, entering northward of the third spar buoy, surmounted by a down-turned broom between two balls, which marks the west side of that bank. Vessels of about 7½ feet draft can use the western channel.

Gräsrännan or southern entrance—Depths.—The southern entrance, between Val Shoal on the west and the western edge of Skabb Reef on the east side, admits small vessels of about 7 feet draft, and is buoyed, for which see the chart.

Town.—Landskrona is a seaport with a large Baltic and local trade, and in 1910 a population of 16,132; there is an old castle, completed in 1543, which is now a prison.

Communication.—Steam vessels run between Landskrona and Malmö and Copenhagen twice daily, and there is a regular service to Helsingborg, Halmstad, Varberg, and Göteborg. Landskrona has railway communication to the northward with Helsingborg, to the eastward with Eslof, and to the southward with Malmö and various parts of the southern portion of Sweden. There are post, telegraph, and telephone offices.

Coal and supplies.—About 2,000 tons of coal are kept in stock, and the coal wharf has depths of from 15 to 25 feet alongside.

Supplies of fresh provisions may be procured, and water from two water boats.

Repairs.—Some repairs to machinery might be executed.

Trade.—The principal exports are butter, eggs, bricks, and machinery, and imports, coal and fodder.

Hven, an island belonging to Sweden, is 2½ miles in length in a northwest and southeast direction by 1¼ miles in greatest width; it is 115 feet high and woodless, with steep shores, especially on the north and west sides, and St. Ibb Church, without tower or spire, is a conspicuous object near its western side; a new church, near the middle of the island, is a good mark.

The shore bank around Hven is very narrow, but on the northwest side it extends about ¼ mile, and therefore is sufficiently wide for small vessels to anchor a little westward of Tuna Village; on the northeastern side there is deep water close to the shore, and 22 fathoms only 600 yards from it.

Buoy.—A red spar buoy, surmounted by two down-turned brooms, is moored near the edge of the bank. Small vessels pass outside it by keeping the roof of St. Ibb Church in sight over the cliff.

Lights.—On the northwest point of Hven a white tower, 39 feet in height, surmounting a red house, exhibits, at an elevation of 98 feet above sea level, a flashing white light, visible 16 miles.

Fog signal.—A siren gives one blast every minute.

Haken.—From a white tower, 38 feet in height, with a red dwelling, situated on the east point of Hven, a white light with fixed and occulting sectors is exhibited, at an elevation of 29 feet above sea level, visible 10 miles. (For sectors, see Light List.)

Fogsignal.—A foghorn gives two blasts every minute. It is heard only in the fairway.

Norreborgs Hamn, on the north coast of the island, has a pier and 295 feet of quay.

There is a depth of 6½ feet at low water in the harbor.

Communication.—The nearest post office is at St. Ibb, and telegraph at Hven.

Trade.—Bricks are exported and coal imported.

Bäckviken, about ½ mile southward of Haken, is a harbor with two piers and 1,033 feet of quay.

The depth in the harbor at low water is 8½ feet.

Light.—A fixed lantern light, with red and green sectors, is exhibited, at an elevation of 12 feet, from a post on the north pier; it is a fishing light and visible 2 miles.

Directions—By night.—The sector of red light leads into the harbor.

Communication.—The post office is at St. Ibb, and telegraph at Hven; there is also a telephone.

Trade.—Grain and beet sugar are exported and coal imported.

Kyrkbacken fishing village, situated on the west coast, close to St. Ibb Church, has a harbor formed by two piers, the northern of which is 450 feet in length, in a southwesterly direction; the southern, 722 feet in length, in a westerly direction, has a bend to the northwestward at its outer end. The harbor is entered through a dredged channel 105 feet in width, and there is 1,410 feet of quay space.

The dredged channel to the harbor has a depth of 13 feet.

Light.—On the south pierhead is an iron stage which exhibits, at an elevation of 12 feet above sea level, a fixed white and red fishing light.

Buoys.—The northern side of the channel is marked by a red spar buoy, surmounted by a broom.

The south side is marked by a plain spar buoy.

Anchorage for small vessels may be obtained off the north side of Hven, in depths of from 2½ to 3½ fathoms, on the bank a little westward of Tuna village, and 200 yards from the beach, with St. Ibb Church bearing about 182°.

Submarine vessels may be exercising between Hven and Saltholm, and should be avoided. (See Chapter I.)

Danish shore—Coast.—From Vedbæk the coast trends in a southerly direction, for 4 miles to Taarbæk, and then a little more to the westward to the entrance to Copenhagen Harbor, and is wooded in parts and generally built over.

The most conspicuous objects are Skodsborg Marine Hotel, the Hermitage, near Taarbæk, and between Jægersborg and Dyrehave, Klampenborg bathing establishment, Ordrup Roman Catholic and Protestant Churches, Gjentofte Church and water tower, Charlottenlund country house, Tuborg factory and harbor, and Hellerup Church.

Depths offshore.—The 5-fathoms contour line, which passes nearly ½ mile off Vedbæk, trends southeastward, rapidly increasing its distance from the coast, and abreast of Taarbæk it is 2½ miles off, inclosing Taarbæk Reef, where it changes its direction to south-southwest and closes the coast, being about 1½ miles off it at the entrance to Copenhagen Harbor.

Skodsborg, 1¼ miles southward of Vedbæk, has a pier 590 feet in length for local steamers, with a depth of 1½ fathoms at it, and two red and one green lantern lights are shown when they are expected. A red flag is hoisted by day.

Communication.—There is a railway station at Skodsborg, and the village has a population of about 600.

Taarbæk, about 2½ miles southward of Skodsborg, has two small harbors, formed by a northern breakwater, about 400 feet in length, in a southerly direction, a south breakwater, about 200 feet in length, in an easterly direction, and a short arm between these; outer entrance, facing east, is about 55 feet and the inner 30 feet in width.

The depth in the outer entrance is 1½ fathoms, and 1¼ fathoms in the harbor; there is a difference of about 1 foot between ordinary high and low water, but nearly 3 feet during gales.

Light.—A fixed green light is exhibited, at an elevation of 16 feet above high water, from a post, 13 feet in height, on the north breakwater head; it is shown from August 1 to January 1.

Taarbæk Reef, the eastern end of which lies 2 miles eastward of Taarbæk, is a sandy shoal about ¾ of a mile in length in an east by south and opposite direction, with a least depth of 2½ fathoms over

the center part; between Taarbæk Reef and the shore there are two patches of 2¾ fathoms.

A rock with least depth of 15 feet surrounded by depths of 23 feet lies 1¼ miles 225° from Taarbæk Reef Lightbuoy.

Light and bell buoy.—A red buoy, exhibiting a flashing white light every 15 seconds, and having a bell, is moored in a depth of 4¼ fathoms, close eastward of Taarbæk Reef.

Bellevue, about ½ mile south by west of Taarbæk, has a pier 262 feet in length for local steamers, at which the depth is 1½ fathoms, and two red lantern lights are shown when they are expected.

Skovs Head Harbor, about 1 mile southward of Bellevue, is formed by a north breakwater about 300 feet in an easterly direction, then turning a similar distance to the southward; the south breakwater is about 300 feet in an easterly direction, and the entrance between the heads, and facing southward, is 50 feet in width. The depth in the entrance is 1½ fathoms, but there is only 1 fathom in the outer half of the harbor, and ½ fathom in the inner half.

Gales between northwest and north raise the water 4 feet, and in exceptional cases nearly 6 feet, while those from southeast to south lower it 3 feet; the water in the harbor is smooth with all winds.

Light.—A fixed red light is exhibited, at an elevation of 14 feet above high water, from a post 8 feet in height, situated on the north breakwater head, between August 1 and March 1.

Dangers.—The 3-fathom contour line extends nearly 1 mile off Skovs Head, and about 1,200 yards eastward of the harbor is a shoal on which the depth is 2½ fathoms; about ¾ mils southward of it are two patches with a depth of 3 fathoms, but outside the 3-fathom contour.

Coal and supplies.—Some coal, as well as fresh provisions and water, can be procured.

Pier.—A local steam vessel pier, 590 feet in length, with 1½ fathoms at its extreme, is situated about 200 yards southward of Skovs Head, and red and green lantern lights are shown when vessels are expected.

Tuborg Harbor, situated 2 miles southwest of Skovshoved, is a storage place for petroleum and other combustible articles, and may be recognized by the zinc-roofed sheds and by Hellerup Church, to the northward of it.

The harbor, about 200 yards in extent, and divided by an arm extending southeast, is approached by a narrow dredged channel, about 800 yards in length, and the entrance to the harbor is about 80 feet in width.

Leading lights.—Two fixed red leading lights are exhibited at elevations of 20 and 14 feet, respectively, from posts 40 yards apart,

situated near the harbor office; when in line, bearing 258°, they lead through the dredged channel, but they are not shown when the harbor can not be entered.

Depths.—There are depths of 2¾ fathoms in the dredged channel, and in the southwest part of the harbor, but in the northeast portion there are only from 1 fathom to 1¾ fathoms.

Northwest gales raise the water 4 feet, and those from south-southwest lower it 3 feet.

Beacons and buoys.—A leading beacon is situated near the harbor.

The northern side of the dredged channel is marked by two broom buoys, and the south side by two with straw wisps.

Pilots can be procured at Helsingör, Copenhagen, and Dragör.

Directions.—The northern half of the chimney of the southernmost factory in line with the beacon near the harbor, bearing 258°, leads through the dredged channel, by day, and the two fixed red leading lights, on the same bearing, lead through by night.

Communication.—The railway station, post, and telegraph offices are at Hellerup, ¼ mile distant.

Water is plentiful at the harbor. A crane will lift 3 tons.

Hellerup Lystbaadehavn (Yacht Harbor) is a small basin with a depth of 8 feet, situated about 600 yards northward of Tuborg Harbor.

Light.—A fixed green light, elevated 16 feet, is shown from a green hexagonal beacon on the East Mole of the harbor from April 1 to November 1, annually.

Beacons.—The 8-foot channel leading to the harbor is marked on the northern side by red posts, each with a broom, and on the south side by white posts, each with a down-turned broom. These beacons are maintained in position from April 1 to November 1, annually.

Hellerup Harbor, immediately southward of Tuborg, and entered from the south side of the dredged channel to the latter, is about 200 yards in length, 50 yards in width, and has depths of from 2 to 2¼ fathoms, but the water is raised and lowered by winds, similar to Tuborg Harbor. The channel of approach has a depth of 2¼ fathoms, after leaving the dredged channel.

The harbor is the property of the Scandinavian-American Petroleum Co.; it can not be entered with strong easterly winds, nor if there is much current.

Evanstone Harbor, about 200 yards southward of Hellerup, is formed by two small breakwaters, and approached through a dredged channel, in which the depth is 2 fathoms, there being the same in the harbor which belongs to a Danish petroleum company.

Beacons and buoys.—A red disk and a white triangle, pointing upward, standing near the quays, when in line lead through the dredged channel.

The north side of the channel is marked by a red spar buoy, surmounted by an upturned broom, and the south side by a white spar buoy with a down-turned broom.

Stubben.—The 3-fathoms contour line is about ¾ mile offshore abreast of Tuborg, but from the western side of the entrance to Copenhagen a shoal, named Stubben, extends for about 1¾ miles in a north by east direction, with depths under 3 fathoms, and is separated from the 3-fathom contour, off Tuborg, by a blind channel named Skude Channel.

The least water on Stubben is 1¾ fathoms, which is situated nearly ½ mile northward of the entrance to Copenhagen Harbor.

Buoys.—A conical red buoy, surmounted by two upturned brooms, is moored in a depth of 3¾ fathoms off the northeast end of Stubben.

A conical red buoy, surmounted by an upturned broom and named "Stubberumpen," is moored in a depth of 4 fathoms on the east side of Stubben.

The east side of Stubben is also marked by a conical red buoy surmounted by two upturned brooms and moored in a depth of 3¼ fathoms.

Clearing mark.—Frelser Church spire, in line with Trekroner Battery northeast, and principal light tower, bearing 200°, leads eastward of Stubben, and the same church spire, in line with Nyholm old crane, bearing 204°, leads farther eastward and in deeper water.

Copenhagen Road consists of the area limited as follows:

On the north by a line joining Taarbæk Harbor and the lightbuoy on Taarbæk Reef, and thence to the position of "Saltholm flak N. E." lightbuoy.

On the east, by a line from the above lightbuoy to the north point of Saltholm, and thence along the west coast of Saltholm to the south point of the island.

On the south by a line from the south point of Saltholm to the position of Drogden Lightvessel, and thence to the position of Aflands Point buoy (red conical with two brooms), and thence to the coast of Zealand in the direction of Balensbæk Church.

Middel Ground, extending from Copenhagen Road to the eastern side of Konge Deep, is an extensive shoal 3½ miles in length, in a north and south direction, its northern extreme being about 1⅓ miles eastward of the north end of Stubben; its greatest width, within the 5-fathom contour line, is about 1⅓ miles.

On the northern half of the shoal the depths are generally from 3¼ to 4 fathoms, with some 3-fathom spots, and near its northern end is Middel Ground Fort, but the southern half, generally known

as Middelgrund, or Middle Ground, has a least depth of 1¼ fathoms; this part of the shoal will be described hereafter in connection with Konge Deep, the channel between its western side and Amager.

Middel Ground Fort, which is situated in Copenhagen Road, on the northern end of Middel Ground, about 2 miles northeastward of Trekroner Battery, is in the shape of two-thirds of a circle and 360 yards in greatest diameter; it stands on the north end of the bank, with depths under 3 fathoms, which extends about 1½ miles northward of Middel Ground.

Light.—A cylindrical white tower, 39 feet in height, with a gray roof, standing on the northeast part of Middel Ground Fort, exhibits, at an elevation of 98 feet above high water, a flashing white light visible 15 miles.

Fog signal.—During thick or foggy weather a fog signal gives two reports every five minutes.

Gun practice.—When firing is taking place from the forts round Copenhagen, the following signals will be hoisted under one yardarm of the signal masts on Middel Ground and Kastrup Forts:

Signal.	Significance.
1 ball	Firing from Middel Ground Fort.
1 cylinder	Firing from Charlottenlund Fort.
2 balls (vertical)	Firing from Trekroner or Lynnetten.
2 cylinders (vertical)	Firing from Melem Fort or Provesteen.
1 ball over 1 cylinder	Firing from Mastrup Fort.
1 ball under 1 cylinder	Firing from Saltholm Flat Fort.

These signals will be shown half an hour before firing commences. When firing is taking place from more than one fort at the same time the various signals will be shown beside one another. For further information a ball will be shown under the other yardarm when firing at long ranges is taking place, none being shown when firing is only at short range.

When firing is actually taking place a red flag will be shown by the fort firing and by the steamer towing the target. The signals are for the guidance of vessels in the channels, but firing will always be stopped to allow vessels to pass.

Spoil Ground.—Several green conical buoys, with basket as top mark, mark a spoil ground southward of Middel Ground Fort. The spoil ground westward of the fort is disused, and the buoys marking it withdrawn.

Landmarks.—The most conspicuous objects when approaching Copenhagen are Middel Ground Fort, Thekoner Battery, Tuborg Harbor, the Eastern gas works, Ny Kalkbraenderi Harbor, the Silo store in Fri Harbor, which is a tall building with a tower at the

northern and the time ball at the southern end, and with another storehouse with a conical turret at each end standing northward of it, Nyholm old crane, and the several churches.

The gas works and a water tower on Amager, both situated to the eastward of East Sundby, are good marks.

Frelser Church, with a remarkable spiral ascent outside, and Frederiks (Christians) Church, are both in Christianshavn; Petri Church, in the western part of the city, and St. Albans, the English church, painted light gray, with a red roof and a slender spire; these have all spires, that of Frelser Church being the highest.

Marmor Church, painted green, near the British consulate, has a conspicuous dome, and Frue Church is known by its square tower, roofed, and surmounted by a gilt cross; the spire of Helligaands Church is supported on open columns.

Nicolaj Tower is eastward of Helligaands Church, and Raadhus Tower is the highest in the city; Gjentoft Church, at a village 3 miles to the northward, is also conspicuous and used as a leading mark.

Anchorages.—Vessels of too great a draft to enter the Outer Harbor anchor in Copenhagen Road, the most general anchorages being on the east side of Stubben and on the eastern side of the northern part of Revshalen, the mark for the latter being Kastrup lime-works in line with the beacons on Prövesteen Wreck, being about 169°, and in depths of from 6 to 7 fathoms, with plenty of swinging room.

A good anchorage for sailing vessels is northward of Middelpult, and on the western side of Middel Ground, with Frue Church in line with the northwest extreme of Trekroner Battery, bearing 222°.

Prohibited anchorage.—Anchorage is prohibited in Copenhagen Road within the area contained by the undermentioned limits, as follows:

The northern limit of the prohibited anchorage is the occulting red and green light on the eastern head of the Stubben Breakwater in line with the fixed red light on the east molehead of the Fri Harbor, bearing 225°.

The southern limit is the occulting red and green light on the northern head of Trekroner Breakwater in line with the fixed red light on the east molehead of the Frihavn, 239°.

The eastern limit is the Middelpult Buoy in line with the eastern angle of Prövesteen Fort, or by night the western limit of the green sector of the northern light on Prövesteen Fort, 177°.

Foreign vessels of war are prohibited from anchoring in or passing through Copenhagen Roadstead without permission.

Pilots.—The pilots for the harbor also take vessels to all ports on both sides of the Sound, as well as out to the northward and through Flint and Drogden Channels. A steam pilot vessel is sta-

tioned near Middel Ground Fort, and a pilot vessel cruises in the roadstead.

Helsingör and Dragör pilots can take vessels into the harbor, but must be relieved by a Copenhagen pilot if the vessel anchors in the road or Outer Harbor.

Pilots.—Copenhagen pilots can pilot vessels from the southward as far as Svinbådan Lightvessel. If, however, vessels wish to proceed past Svinbådan Lightvessel, pilots must be changed at Helsingör.

Tugs.—Steam tugs are available, there being 32 attached to the harbor; 7 of these are over 200 i. h. p.

Directions.—Southward of Kronborg Point the sound is divided into two channels by Disken and by Hven Island, the eastern channel being the deeper, but for sailing vessels the western channel will be found to afford more protection from the prevalent southwesterly winds.

Western Channel.—When southward of Kronborg Point, if proceeding through the western channel, steer for Kulla Gunnarstorp in line with Kronborg Point, bearing 5°, which leads westward of Disken, in not less than 7 fathoms water, and in a vessel of any draft the Danish coast should not be approached under the depth of 6 fathoms.

The above mark may be kept astern, steering 185°, till abreast of Humlebæk, when the coarse should be more to the eastward, but not to pass the northwest point of Hven under the distance of ½ mile. After Hven is passed, its northwest point should be brought in line with Kronborg Point, bearing 350°, which will lead eastward of Lous Flat in a depth of 7 fathoms, and when Frelser Church is in line with Nyholm old crane, bearing 204°, Kron Channel, or the channel by which it is intended to pass to the southward, may be steered for.

Vessels whose draft will allow them to cross Lous Flat, where the depth is 4 fathoms, can steer direct from Kronborg Point to pass eastward of Taarbæk Lightbuoy, but not going into a less depth than 6 fathoms toward the Danish coast.

Taarnby Church, on Amager, midway between Trekroner and Prövesteen forts, bearing 191°, leads eastward of Taarbæk Reef Buoy, and smaller vessels drawing not more than 12 feet can cross Baarbæk Reef.

By night.—Kronborg Point Light should be kept bearing north until past Hven Lights, when steer 162°, which will lead eastward of Lous Flat.

Eastern Channel.—Between Helsingborg and Knähaken the Swedish coast should not be approached in a less depth than 10

fathoms by large vessels, and Glumslof Church in line with the south end of Rudebäck Tile Works, bearing 134°, leads westward of the latter shoal.

From Kronborg Point a 148° course may be steered until Haken, the east point of Hven, bears about 171°, when a course may be shaped to round it at a distance of about ¾ mile. When southward of Hven, Kärnan tower well open of Haken, the east point of that island, bearing 354°, leads westward of Väster-flacket, and St. Ibb Chuch in line with the first clay cliff southward of it, 328°, leads southwest of the same shoal.

Directions for channels leading to Copenhagen Road will be given later.

Copenhagen.—The harbor of Copenhagen, separating Zealand from Amager Island, consists of outer, inner, and southern harbors and extends, from its entrance, for a distance of about 2½ miles in a south-southwest direction, from which the south channel stretches for about 6 miles along the western side of Amager Island.

The harbor is deep, specious, and perfectly secure and is divided into two sections, the naval and commercial harbors, the latter containing the customs harbor and the free port.

Western side.—The western side of the entrance to Copenhagen Harbor is formed by the southeast edge of Stubben, which trends in a southwesterly direction for about 1 mile from Stubberumpen Buoy along the northwest side of Kron Channel, the entrance channel; on the south side of Stubben is Stubben Breakwater, built in the shape of an arc of a circle, and 960 feet in length, in an east and west direction, the inner circumference of the circle being to the northward.

Westward of Stubben Breakwater is Ny Kalkbrænderi Harbor, in course of construction, its northern breakwater nearly reaching to the west end of Stubben Breakwater.

Eastern side.—Trekroner Battery, somewhat in the form of half an octagonal figure, 300 yards in width and surmounted by grassy slopes, stands on concrete blocks in depths of from 3 to 7 feet; a shoal, with depths under 3 fathoms, and on which are the remains of Gamle, or old Trekroner, extends to the northward of Trekroner for about 350 yards.

From the north end of this shoal extends, in a north-by-east direction, Svane Shoal, a shoal with less than 4 fathoms water over it, and on the western side of these shoals is Trekroner Breakwater, 1,055 feet in length, similar in shape to Stubben Breakwater, but having a northerly direction, and its inner circumference facing eastward; its northern end forms, with the eastern end of Stubben Breakwater, the entrance into the harbor.

Lights.—Stubben breakwater is marked at each end by a light. The western, an occulting white light is exhibited from a grey beacon, at an elevation of 16 feet above high water.

On the eastern end of Stubben Breakwater is a cylindrical gray lighthouse, 23 feet in height, which exhibits, at an elevation of 24 feet above high water, an occulting light with red and green sectors; the red light is visible 8 miles, and the green light 6 miles. (For sectors, see Light List.)

Trekroner Battery.—On the east side of Trekroner Battery a cylindrical white tower, 39 feet in height, exhibits, at an elevation of 66 feet above high water, a fixed and flashing white light, the flashing light being visible 13 miles and the fixed 12 miles.

Fog signal.—A fog siren gives two blasts, high and low, each of two seconds duration in quick succession every minute.

Trekroner Breakwater.—A cylindrical gray tower, 23 feet in height, situated on the north end of Trekroner Breakwater, exhibits, at an elevation of 24 feet above high water, an occulting light with red and green sectors, the red light being visible 7 miles and the green 5 miles. (For bearings of sectors, see Light List.)

Fog signal.—A fog bell is struck continuously for five seconds in every twenty seconds.

Trekroner leading lights.—On the north and southeast sides of Trekoner Battery are iron towers painted red, with a white cross, and 197 yards apart; each beacon exhibits a fixed red light, that from the north tower, which is 23 feet in height, at an elevation of 47 feet, and from the southeast tower, 13 feet in height, at an elevation of 37 feet above high water; the lights are in line, bearing 317°. The higher light is visible 12 miles and the lower light 11 miles, and they are seen for 10° on either side of the leading line.

Dangers—Middelpult.—On the southeast side of the entrance to Kron Channel and 1,300 yards 59° from Trekroner Battery, is Middelpult, a shoal on which the least depth is 3¼ fathoms; it extends for about 450 yards in a north-northeast and opposite direction, with a breadth of 300 yards within the 5-fathoms contour line.

Buoy.—A conical buoy, painted red and white in bands, and surmounted by a ball, is moored, in a depth of 3¼ fathoms, on the center of Middelpult.

Revshalen, a triangular-shaped shoal, about 700 yards in width, in an east and west direction, extends about 400 yards southward of Trekroner Battery; on its eastern side and protecting the harbor is Trekroner south breakwater, 1,235 feet in length, in a north and south direction.

Lynetten, southward of Revshalen and separated from it by Lynette Channel, a narrow channel leading into Copenhagen Harbor, has a shoal extending northward of its east end, and on it is

Lynetten north breakwater, 655 feet in length in a northerly direction, leaving between its head and that of Trekroner south breakwater the entrance to Lynette Channel, about 250 feet in width.

Light.—On the north end of Lynetten Breakwater a circular gray tower, 10 feet in height, exhibits, at an elevation of 14 feet above high water, a fixed light, with white, red, and green sectors; the white light is visible 6 miles, the red light 4 miles, and the green light 3 miles. (For bearings of sectors, see Light List.)

Mellem Fort, about 1,400 yards southeast of Lynetten, is about 150 yards in extent and situated on the shore bank, which here and for nearly 1 mile southward extends about ½ mile from the shore. A small boat harbor is situated on the southwest side of the fort.

Lights.—Two fixed green lights are shown occasionally from frames on Mellem Fort at elevations of 28 and 18 feet above high water.

A fixed white lantern light is shown at an elevation of 8 feet above high water from a gray post 3 feet in height on the western mole; it is only shown between November 15 and February 15.

Prövesteen, a fort on the shore bank, ½ mile southward of Mellem fort, is about 200 yards in length in a north and south direction, with an opening to the westward.

Prövesteens Wreck consists of three wrecks filled with stones, forming a danger more than 100 yards in length and drying at very low water; the south end is about 200 yards southeast by east of Prövesteen Fort and 100 yards southeast by east of the south end is old Prövesteen, the remains of old Prövesteen Fort.

Leading lights.—On the north side of Prövesteen Fort a gray concrete building exhibits, at an elevation of 26 feet above high water, an occulting light with white, red, and green sectors, visible, respectively, 10, 9, and 8 miles. (For sectors see Light List.)

The rear light exhibited at an elevation of 52 feet above high water from an iron stand 49 feet in height is fixed red and visible 11 miles.

These light structures, and especially the front one, are exceedingly difficult to distinguish by lay. The lights are in line, bearing 187°, and are 150 yards apart.

Two fixed green lights are occasionally shown for the use of torpedo boats.

Beacons.—Prövesteens Wreck is marked at its north end by a red pole beacon surmounted by two cones, the points of which are pointing away from each other.

The south end is marked by a similar beacon, but a black ball is placed over the cones.

Sewer.—From a point on the land about 900 yards westward of Prövesteen Fort a sewer extends in an easterly direction for a distance of 1,600 yards, the end being in a depth of 5½ fathoms.

Beacons.—At the shore end of the sewer are two beacons painted white, the eastern surmounted by a triangle, with its apex pointing upward.

The western beacon is similar, but that the triangle has its apex pointing downward.

Lights.—A fixed green light is exhibited from each beacon, and the lights are in line, bearing 250°, the sewer having an opposite direction, which is pointed out by the lights to prevent vessels anchoring near it.

Buoys.—The extreme end of the sewer is marked by a conical red buoy, surmounted by three upturned brooms, which is moored 50 yards outside its end, in a depth of 5½ fathoms.

Three conical green buoys are also moored on the northern side of the line of the sewer.

Torpedo and submarine mining ground.—A torpedo and submarine practice ground is situated between Mellem and Prövesteen forts; its position will be best seen from the chart.

Occasional leading lights in line mark its eastern boundary.

Buoys.—A line of six wreck buoys, painted green, extends from 140 to 1,070 yards northward of Prövesteen Fort.

Two wreck buoys, painted green, are moored 270 and 400 yards northeast of Mellem fort.

Kronlöb (Krone Channel), the main entrance to Copenhagen Harbor, is entered southeastward of Stubben, and passes between the east and north ends, respectively, of Stubben and Trekroner breakwaters, where it is 515 feet wide.

Depths.—The greatest depth that can be depended on is 29 feet, which extends from the entrance, over a width of about 100 yards, as far as the entrance to Frihavn.

There are several depths of 26 and 27 feet on the north side of the center of the channel, abreast of the red buoy, with two upturned brooms, which marks the eastern side of Stubben.

Dredging is carried on by five dredges, and there is an ice breaker.

Leading lights.—Two fixed red leading lights for Kron Channel are exhibited near the extreme of the eastern mole of South Frihavns Basin and are 142 yards apart, and in line bearing 233°.

The rear light is shown, at an elevation of 38 feet above high water, from a gray mast, 32 feet in height, on the inner part of the molehead, and is visible 11 miles.

The front light, at an elevation of 19 feet above high water, is exhibited from a red tower, with a white band, and situated on the molehead.

Fog signal.—A fog triangle is sounded when a ferry steamer is expected.

Port.—The Yder Havn, or Outer Harbor, extends from the entrance for 1 mile, to Bomlobet, its total area being 20,646 square feet; it has the following harbors or basins:

West side.—Ny Kalkbrænderi Harbor, or New Limeworks Haven, the outer harbor on the west side, is in course of construction, and will have a north breakwater, extending in an east-southeast and southeast direction, nearly 1,300 yards in length; the depths are, in the present harbor, from 9¼ to 11¼ feet.

Leading lights.—Two fixed red leading lights are exhibited, at elevations of 17 feet above high water, from posts, situated westward of the harbor, and on the south mole, respectively; they are in line bearing 267° and 230 yards apart, but are only shown from August 1 to May 1.

North Harbor, next southward of Ny Kalkbrænderi, has a depth of 24½ feet.

Light.—On the mole head on the north side of the entrance to North Harbor, a fixed light, with red and green sectors, is exhibited at an elevation of 12 feet above high water.

South Frihavns Basin.—The entrance to South Frihavns Basin is immediately southward of North Harbor and receives protection, from the north, by a detached breakwater 400 yards in length, in a southeast direction, with an angle to the northeast. There are 48 electric cranes, one lifting 20 tons, also electric grain elevators and railways in this basin.

North Harbor is considered as forming a part of Frihavns, and in addition to the principal basin, the other basins in it are Mellem Basin and East and West Basins. The depths in the basins are as follows: Mellem Basin, 24½ feet; Principal Basin, 30 feet; East Basin, 30 feet; and West Basin, 26½ feet.

Lights.—On the southeast head of the detached breakwater a fixed green light is exhibited, at an elevation of 10 feet above high water, from a cylindrical gray tower. For lights on the southeast side of entrance, see above.

Ferry lights.—About the time of the arrival and departure of the steam ferry, the following fixed lantern lights are exhibited:

On Frihavn northwest mole, a green light.

On the southeast mole, a red light.

On the middle mole, a red and green light.

At the head of each ferry berth are two red lights as a guide to them.

During foggy weather a fog bell is sounded on the middle mole.

Lystbaade Harbor (Pleasure Boat Harbor), a small basin with a depth of 12 feet, is situated close southward of the south end of East Basin.

Light.—A fixed green light is shown on the north side of the entrance to Lystbaade Harbor, but it is only shown from March 1 to November 1.

East side.—The outer basin, on the east side of Outer Harbor, is Lynetten, which has a least depth of 10¼ feet.

Buoy.—The west side of Revshalen is marked by a white can buoy.

Petroleum and Revshaleöen Basins are, next southward of Lynetten, the first has depths of from 22 to 24 feet, and the petroleum stores are situated on its eastern side. The other basin is from 8¼ to 14¼ feet in depth and has a dry dock on its eastern side.

Mooring buoys.—There are a number of mooring buoys, the positions of which will be seen on the chart.

Bomlöbet, the entrance to the Inner Harbor, is 130 feet in breadth and has two piers which can be closed by a boom; from this Inner Harbor extends to Langebro and has an area of 4,807 square feet, with 11,078 feet of masonry and 3,087 feet of wood quay space.

Light.—A fixed red light is shown westward of Bomlöbet when that channel is closed.

Toldbodbommen Light.—On the extreme end of the western pier, known as Toldbodbommen or customhouse pier, is a lamp-post, 12 feet in height, which exhibits, at an elevation of 17 feet above high water, a fixed light with red and white sectors, showing red over Bomlöbet and white over the Inner Harbor.

Leading lights, also shown from this pier to mark the 26-foot western limit of the channel, are fixed green, exhibited at elevations of 22 and 18 feet above high water, from posts 13 and 4 feet in height, and shown over an arc of 7° on each side of the leading line.

Bombroen Light.—On the south end of Bombroen, or the east pier of Bomlöbet, a green fixed light is exhibited, at an elevation of 17 feet above high water, from a lamp-post 11 feet in height, and is visible over the harbor to the southward.

Fog signal.—During thick or foggy weather a fog gong answers vessels' signals.

Leading lights, shown from the north end of Bombroen to mark the eastern 26-foot limit of the channel, are fixed red, and exhibited at elevations of 20 and 10 feet above high water, from poles 14 and 4 feet in height; they are visible over an arc of 7° on each side of the leading line.

A fixed red light is shown at Nyholm.

Basins.—The three principal basins in Inner Harbor are Kvæsthusgade, or Naval Hospital Basin, which has a depth of 15½ feet; Nyhavn, with from 9¼ to 18½ feet water; these are on the west side;

and on the east side is Christianshavn, which has depths of from 13½ to 20½ feet.

South Harbor.—The south harbor, which extends to the southwestward from Langebro, has an area of 6,266 square feet, with depths of from 3¼ to 3¾ fathoms.

Lynette Channel, or the eastern channel into the Outer Harbor, entered between the south end of Trekroner south breakwater and Lynetten north breakwater, is about 30 yards in width at its narrowest part, with a depth of 2 fathoms; it is suitable for small vessels.

Buoys.—On the north limit of the white sector of light from Lynetten north breakwater, a conical red buoy, moored in a depth of 4 fathoms, about 500 yards northeast of the light. A conical red buoy is moored in a depth of 1¾ fathoms on the southeast end of Revshalen.

The north side of the channel is marked by three red spar buoys, each surmounted by an upturned broom.

On the south limit of the white light from Lynetten, and about 750 yards eastward of it, a white can buoy is moored in 4 fathoms water.

A white spar buoy, surmounted by a down-turned broom, is moored, in a depth of 1¾ fathoms, on the northeast end of Lynetten Shoal.

The south side of the channel is marked by three white spar buoys, each surmounted by a straw wisp.

Direction—Krone Channel.—Frelser Church, in line with Nyholm old crane, bearing 204°, leads eastward of Stubberumpen, and to the entrance to Kron Channel, and vessels of deep draft should not go westward of Frelser Church in line with Trekroner northeast lighthouse, bearing 200°, nor farther eastward toward Middelpult than to have Frederiks (Christians) Church well open westward of Nyholm old crane, 211°, or Marmora Church, ranging across Trekroner battery between 214° and 220°, is a good mark for the sides of the channel. When the light beacon and tower on Frihavn are in line, 234°, steering for them will lead through Kron Channel, between the breakwater heads.

To proceed through the outer harbor, in a depth of 4¼ fathoms, Frelser Church should be kept midway between Bomlöbet pierheads, bearing 193°.

Vessels coming from the southward through Konge Deep, may, after passing Middelpult, keep over toward Kron Channel, when Jacobs Church comes on with the north side of the entrance to North Harbor, bearing 258°.

By night.—The sector of occulting red light, from Prövesteen, bearing between 186° and 191°, leads eastward of Taarbæk Reef, in a depth of 4 fathoms, and a vessel may steer about 191° in this sector

until the leading lights for Kronlöb, exhibited from Frihavn Mole, are in line 234°, which leads through Kron Channel, and when southward of Stubben breakwater a 194° course will lead through Outer Harbor to Bomlöbet, with the green lights indicating the western limit of 26 feet, on the starboard, and the red lights denoting the same for the east side, on the port hand.

Coming from the southward, the sector of occulting white light from Prövesteen, bearing between 182° and 186°, leads eastward of Middelpult.

Signals.—The following signals for the passage of Bomlöbet are shown:

By day.—One cone hoisted on a mast near the west side of Bomlöbet denotes that the channel is closed.

When two cones are hoisted it indicates that vessels coming from the southward can not proceed, and three cones give a similar direction to those coming from the northward.

By night.—A red lantern light, hoisted on a mast at the west side of Bomlöbet, indicates that the channel is closed to vessels.

At Langebro and Knipplebro, red lantern lights are shown, one signifying that vessels can not pass, two that vessels from the north, and three that vessels from the south, can go through.

Storm and weather signals are shown at Nyholm old crane. (See Chapter I.)

Compass deviation.—To enable vessels to ascertain the error of their compasses a pole marked with a letter P, is placed within the detached breakwater eastward of North Harbor, and from it the true bearings of the objects after mentioned, are as follows:

Frederiks Church, 195° 38′.

Frelsers Church, 186° 04′.

Nyholm crane, 169° 59′.

Trekroner Lighthouse, 114° 59′.

Tides.—It is high water, full and change, in Copenhagen Harbor at 9h. 12m.; there is little difference between high and low level, but gales from west and northwest may raise the level about 4 feet, while those from between east and south may lower it 3 feet.

Anchorage.—The anchorage in the harbor for large vessels is on the eastern side, abreast and southward of Lynetten Fort, or they can moor to any mooring buoy available.

Small vessels anchor on the western side, but farther north and between Trekroner Battery and Lynetten Fort.

Current and water level.—The stream through Kron Channel usually follows the direction of that channel, but sometimes the south-going stream sets somewhat strongly toward Stubben, and the north-going stream does the same toward Trekroner Battery.

Ice information from the wireless telegraph station is given daily during winter at noon and 10 p. m. (uniform time). It is given in the English language, and thus:

The sign —— — —— — —— and the call letters G R A repeated three times.

The words "Ice report," the number of words, and the information given twice and divided by the sign —— — — — ——.

Finish: The call letters G R A three times and the sign — — — —— — ——.

Ice.—Average ice conditions, see Appendix.

City.—Copenhagen, the capital of Denmark, the residence of the Sovereign, and the seat of Government and of Parliament, is the only fortress in the Kingdom, and is the arsenal and naval station; it was a fishing hamlet in the tenth, but commenced to gain importance in the thirteenth century.

The large western section on Zealand is separated from the eastern section, on the northwest part of Amager, by the harbors, and the southern portion, inside the ramparts, is the oldest; in this part is Slotsholmen, surrounded by canals and crossed by seven bridges, but owing to the numerous fires the city has no antique appearance.

The citadel, with its moats, ramparts, and drawbridges, is at the northern part of the inner town, and the harbor is protected by sea forts; the environs present a diversity of sea and forest, lakes, and fertile fields, with hamlets and country seats.

The Raadhus is probably the most imposing of the buildings, with its richly articulated façades, rounded arch friezes, limestone, ornamentation, and decorative figures. The Christiansborg, Rosenborg, and Charlottenborg palaces, the Theater Royal, the Thorvaldsen Museum, and the Ny-Carlsberg Glyptothek, with its collection of sculptures, are worthy of notice, and besides there are numerous churches, some of which have been already mentioned.

A line of streets, running in a northeast direction from the Raadhus, is the most busy part of the city, and contains some handsome old and new buildings, but the old town has some narrow, winding streets; there are several parks and public gardens.

A United States minister, a consul general, and vice and deputy consul general are resident, and in 1911 the population of Copenhagen, with suburbs, was 559,398.

Communication.—Copenhagen has steamship communication with Goole, Hull, Leith, and Newcastle every week; daily communication with Lübeck and Malmö; three or four times weekly with Göteborg and Helsingborg; twice weekly with Christiania and Hangö; weekly with Abo and Stettin; and frequently with Stockholm. Steam vessels from British and German ports and those from

Göteborg, Stockholm, and Christiania land at the customhouse west of Bomlöbet, while those from Danish ports go to the Kvæsthusbro.

Motor boats ply to different parts of the harbor, and there is a steam ferry to Malmö, which crosses about nine times daily, and through railway carriages for Sweden are taken on it.

Several lines of railway branch out from Copenhagen. To the northward is a light railway to Helsingör, with stations at most of the places between; three lines run to the northwestward—the northern to Frederiksborg, from which there are branches to Helsingör, Gilleleje, and Frederiksværk; southward of this is a line to Stangerup, and one to Frederikssund; and in a westerly direction a line extends across the island to Kallundborg.

Still further south is a line to Halskov and Korsör, with a branch to the northward to Kallundborg. From Roskilde, which is a junction on these lines, a railway runs to Kjöge and thence to Rödvig and Faxe Bay, and a branch also goes to Næstved, from which is connection with Præsto and Vordingborg.

The railways run on to the quays, and there are four stations for the harbor railway, which crosses the harbor by Langebro, Borsbroen, and Frederiksbroen bridges; the nearest stations to the Inner Harbor are at the Customhouse, Larsens Plads, and Havnegade. The tramcars are mostly electric.

There is telegraphic communication with all parts and telegraph offices near South Frihavns Basin and North Customhouse.

Vessels in the Outer Harbor can telephone to the city.

Radio telegraph station.—The radio telegraph station is at Orlogsvæ ret, or the Royal dockyard, on the south end of Nyholm, and vessels can communicate with it within a radius of 200 miles, the hours of attendance being from 7h. a. m. in summer, or 8h. a. m. in winter, to 9h. p. m. The call letters O X A.

Coal and supplies.—About 100,000 tons of coal are kept in stock, and a somewhat similar quantity is imported, but no patent fuel or oil fuel is obtainable. Coaling can be carried out either alongside coal wharves—there being one 600 feet in length in the South Frihavns Basin and another 1,400 feet in length in the Customs Harbor—or at the anchorages by lighters, of which there are 27, and 17 of these hold from 124 to 419 tons, so that from 1,000 to 1,500 tons can be put on board in 24 hours, although in the road northerly winds with a sea may interfere with the work.

Fresh provisions are generally cheap and plentiful, the prices varying according to the season. Water can be obtained from steam water boats or at the following watering places: On the north side of North Harbor, where the depth is 2¼ fathoms, or at the northeast side of the same, where it is 4 fathoms, also near North customhouse; southward of Bombroen; near Kalleboer Bridge, north of Langebro and near Frihavn Quay.

Docks and patent slips.—

Name of dock.	Length.		Breadth of entrance.	Depth at H. W. O. S.		Lifting power.	Date built.	Remarks.
	On blocks.	Over all.		On sill.	On blocks.			
						Tons.		
Floating Dock (Burmeister & Wain's).	493	493	70	23	.....	11,500	1906	
Dry Dock, Upper...	271	278	58	23	}	.....	.....	Can be used as one dock; 455 feet long on blocks.
Dry Dock, Lower...	169	169	65	23				
Gamle Dry Dock...	246	260	52	15½	.....	.....	.....	
Government Dry Dock.	277	288	59½	20½	20	.....	1858	
Reershaleöen Dry Dock.	450	469	65	23	.....	.....	.....	
Reevshaleöen Floating Dock.	.....	492	77	25	.....	.....	.....	
Floating Dock (Floating Dock Co.'s).	296	296	50	.....	17	2,900	1898	Another smaller one of 600 tons lifting power.
Floating Dock (Government No. 1).	104	106½	27½	.....	7½	145	.....	
Floating Dock (Government No. 2).	113	113	31	.....	11½	250	.....	
Patent slip.....	192 (cradle).	.....	23 (cradle).	Forward.	12½	} 1,870	.....	
				Aft.....	20½			
Patent Slips (Burmeister & Wain's) No. 3.	309 (cradle).	.....	55 (cradle).	Forward.	7	} 2,500	1884	
				Aft.....	19			
Patent Slips (Burmeister & Wain's) No. 2.	247 (cradle).	.....	55 (cradle).	Forward.	6	} 2,000	1874	
				Aft.....	17			
Patent Slips (Burmeister & Wain's) No. 1.	247 (cradle).	.....	55 (cradle).	Forward.	6	} 2,000	1874	
				Aft.....	17			

Repairs.—The shipbuilding and engineering works which undertake all kinds of work include also the Danish Government works; Messrs. Burmeister & Wain can undertake all large repairs. There is an 80-ton floating and a 70-ton standing crane, besides a large number of electric cranes in the various basins. Two salvage companies have vessels and tugs, one has pumps which will discharge from 400 to 6,000 tons of water per hour, with 2 pontoons capable of lifting 890 tons.

Time signal.—The time signal, made from a mast 164 feet in height, and 174 feet above the water, on the Silo Store, at the north end of the quay separating East and West Basins, in South Frihavns Basin, consist of a black ball, hoisted half up at five minutes before the signal is made, and close up three minutes before the signal is made; it is dropped at Greenwich mean time, equivalent to 1h. 0m. mid-European time, the standard used throughout Denmark. The signal is not made on Sundays. The time may also be obtained from the pilot inspector.

A clock in the corridor of the harbor administration at North customhouse keeps standard (mid-European) time, and the daily

rate is exhibited at the clock, so that it can be used for rating chronometers.

Trade.—The chief exports, consisting of agricultural produce, grain and pulse, feeding stuffs, manufactured articles, hair, feathers, skins, metals, etc., and the imports of meat and provisions, grain and pulse, tallow, oil, tar, minerals, and metals.

Konge Deep, the channel between the shore bank, southward of Lynetten, with the dangers on it already described, and Middle Ground, is about ¾ mile in width at its northern end, but narrows to less than ⅓ mile at its southern end; its general direction is south-southeast.

Western side—Amager.—The northern part of the east coast of Amager forms the western side of Konge Deep, the island generally being flat, well built over, and without trees; from its northern end the east coast trends in a direction a little eastward of south, for 3 miles, to Kastrup Harbor and lime works, and the most conspicuous marks are Sundby Water Tower and Church.

The dangers on the shore bank on the western side of Konge Deep have been already described as far as Prövesteen Fort, and southward of it the shore bank, to the 3-fathom contour line, increases its distance from the coast to about 1 mile.

Sundby Hook, a sandy ridge, the north end of which is about 1 mile southeast by east of Prövesteen Fort, extends in a southerly direction for about ¾ mile, with a greatest breadth of 250 yards and depths of from 2 to 2¾ fathoms; its southern end is named Svalerumpen.

Buoys.—The northeast end of Sundby Hook is marked by a conical red buoy, surmounted by an upturned broom. It is in 4 fathoms water.

Svalerumpen is marked on its east side by a conical red buoy, surmounted by two upturned brooms, moored in a depth of 4 fathoms.

Eastern side.—Middel Ground has been already referred to, and its southern portion, which is about 2 miles in length in a north and south direction and ¾ mile in greatest width, within the 3-fathom contour lines, forms the east side of Konge Deep.

Stretching from its southern end is a narrow ridge about 1¼ miles in length with a greatest width of ¼ mile, which has depths of from 1¼ to 2 fathoms.

Buoys.—The western edge of Middel Ground, which borders Konge Deep, is marked by the three following buoys:

A white can buoy, in a depth of 3¾ fathoms, and surmounted by a down-turned broom, about 1,800 yards eastward of Trekroner Battery.

A similar shaped and painted buoy, with two down-turned brooms, about 1,200 yards northeast by east of Prövesteen Fort, in a depth of 6 fathoms.

A similarly shaped and painted buoy, surmounted by three down-turned brooms, in 6 fathoms, about 1,500 yards eastward of Prövesteen Fort.

South Buoy (Söndre Hoved Tonde) of Middel Ground is conical, painted red and white in bands, and surmounted by a ball; it is moored in a depth of 3¾ fathoms off the south point of the shoal.

Lightbuoy.—A red and white horizontally striped lightbuoy, marked "Middelgrund S," and exhibiting a flashing green light showing flash one and a half seconds, eclipse three and a half seconds, is moored about 800 yards southward of Middel Ground; it will be withdrawn when ice renders it necessary and will not be replaced by a winter buoy.

A wreck buoy, painted green and surmounted by staff and flag, is moored, in a depth of 7 fathoms, close southward of a wreck with a depth of 25 feet over it, and 300 yards east by south of South Buoy.

Depths.—The depths in the northern part of Konge Deep are from 6 to 8 fathoms, but between Sundby Hook and the southwest side of Middel Ground, where the breadth between the 5-fathom contour lines on each side is only 600 yards, they are from 5¾ to 6½ fathoms.

Directions.—Vessels from the northward, having passed westward of Middel Ground Fort, may steer to pass eastward of Middelpult, which is more direct, with Maglebylille Mill open eastward of Prövesteen Fort, bearing 182°, which mark, from abreast of Taarbæk Reef, also leads in a depth of 4 fathoms. The water tower on Amager ranging across Mellem Fort, between the bearings of 192° and 195°, marks the channel between Middelpult and Middel Ground.

When Gjentofte Church is in line with the northeast side of Trekroner Battery, bearing 319°, it should be used as a stern mark, and steering 148° will lead through Konge Deep.

Or a vessel may pass northwestward of Middelpult, with Nicolaj Tower in line with the middle of Trekroner Fort, bearing 215°, and steer into Copenhagen Road on this mark, and when Jacob's Church comes on with the northeast extreme of North Harbor, 247°, steer 174° for Prövesteen Fort until the leading marks given above for Konge Deep come in line.

By night.—From close eastward of Taarbæk the fixed red and occulting lights on Prövesteen, in line bearing 187°, will lead in not less than 3¾ fathoms water, to the eastward of Middelpult, but as it also leads close to the edge of Middel Ground when abreast of Middel Ground Fort steer into the white sector of occulting light

from Prövesteen, between the bearings of 182° and 187°, and when Trekroner Battery fixed red leading lights are in line 320°, steer 140°, with them astern, which will lead through Konge Deep.

To pass westward of Middelpult steer with Prövesteen red leading lights in line, 187°, until the fixed red leading lights for Kron Channel are in line, 234°, when alter for them, and steer on this line till on the western limit of the occulting green sector from Prövesteen, 176°, and keep just on this until Trekroner Battery leading lights are in line.

Hollænder Deep, between the eastern side of Middel Ground and the western side of Saltholm Flat, is the eastern approach to Drogden Channel from the northward and, being straighter and broader than Konge Deep, is more suitable for large vessels.

Middel Ground, forming the eastern side of the channel, has been already described.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored, in a depth of 3¼ fathoms, on the eastern side of the northern part of the shoaler portion of Middel Ground.

Saltholm, the shoal water extending westward of which forms the east side of Hollænder Deep, is about 4 miles in length in a north and south direction, with a greatest breadth of 1¾ miles, and so low that from a distance it resembles a chain of small islands, which are, in reality, mounds and clumps of trees; it is without any very conspicuous object, except in places where may be seen the chimneys of the various lime quarries or a solitary house. It is surrounded by an extensive flat, and except at two piers on the west coast nothing larger than a boat can approach its shores.

Saltholm Flat extends in a northerly and northwesterly direction from the north end of Saltholm, but the 3-fathom contour line of the western edge of the flat, which trends in a southerly direction, is generally about 1 mile off the coast; toward the southwest end of the island the flat again extends, and is nearly 2 miles southwestward of the southwest point.

The eastern and southeastern sides of the flat are described with the approach to Malmö.

The portion of the flat extending north and northwest of the island is about 3 miles in breadth, and the depths on it are less than 1 fathom for about ½ mile, from 1¼ to 2 fathoms for about 1 mile, and under 3 fathoms for nearly 3 miles from the north end of the island, from which the 5-fathom contour line, inclosing the north part of the flat, is about 4 miles distant. On the northern part are several detached patches with 2 fathoms or less water.

Fort.—About ½ mile within the north point of the flat, where the depths are from 2¼ to 2¾ fathoms, a fort is constructing, and this

part is a practice ground for gunnery, submarine mining, and torpedoes, the area being marked by green buoys during the time these exercises are being carried out.

Caution.—When gunnery practice is being carried out by night the firing area is illuminated by searchlights, and at such times vessels should avoid the locality.

Lights.—On the southeast side of the fort is a beacon 36 feet in height, which exhibits, at an elevation of 66 feet, a group flashing white light, visible 9 miles.

A fixed red light is exhibited at an elevation of 13 feet above sea level at the southern point of the fort from the western harbor molehead.

Fog signal.—During thick or foggy weather a fog bell will be rung for about five seconds in every minute, terminating with three clearly separated strokes; it is situated on the north side of the fort.

Bellbuoy.—A white bellbuoy, surmounted by two down-turned brooms, is moored in a depth of 6½ fathoms northwestward and northward of some isolated patches of 3 and 3¼ fathoms off the northwest side of Saltholm Flat. When removed for ice this buoy is replaced by a white can buoy surmounted by two down-turned brooms.

Ryggen, on the western side of the northern part of Saltholm Flat and separated from it by a channel about 200 yards in breadth with depths of from 5¼ to 6⅝ fathoms is a sandy shoal nearly 1,200 yards in length in a north and south direction and 200 yards in breadth, within the 5-fathom contour line; the depths on the shoalest part are from 2¼ to 2¾ fathoms.

At 600 and 1,400 yards in a north-northeast direction from Ryggen are shoals with depths of 3 and 3¼ fathoms, respectively, and about 400 yards east-southeast of the latter is one of 3 fathoms; the bellbuoy above mentioned is a guide for them.

Lightbuoy.—A white lightbuoy, marked "Ryggen," is moored on the western side of the southern part of the shoal and exhibits a flashing red light with a period of system of 15 seconds, showing flash 5 seconds, eclipse 10 seconds.

Buoy.—A white can buoy, surmounted by a down-turned broom, is moored on the western edge of Saltholm Flat, about 1 mile southward of Ryggen Lightbuoy; it is known as Smaagrundene Northwest Buoy.

Shoal.—About ⅓ mile southward of the above buoy a shoal, formed by a wreck, lies on the edge of the bank, but it has not less than 5 fathoms water over it.

Svælget is that part of the channel southward of Middel Ground at the meeting of Konge Deep and Hollænder Deep; it has depths of from 6 to 8 fathoms.

Depths.—The depths in Hollænder Deep are from 6 to 9 fathoms, the narrowest part of the channel being about 4½ cables.

Directions.—The directions for Hollænder Deep will be given with those for Drogden Channel, after the objects which form the leading marks have been described.

Drogden Channel—West side.—On the east coast of Amager, southward of Sundby, the most conspicuous objects are Kastrup Works, with high chimneys close to the northward of them; Taarnby, Hollænderby, and Dragör Churches; Dragör water tower and beacons; and a little grove west-southwest of Dragör.

Depths offshore.—Southward of Svalerumpen, the 5-fathoms contour line is about 1 mile offshore, inclosing Kastrup Knæ and Nordre Röse, and continues that distance till about 1 mile southward of the latter, when it crosses Drogden Channel, passes around Knollen and Kalk Ground, and with a short turn to the southward joins the similar contour line of the west coast of Saltholm; with a few exceptions, the depths in the channel to the southward of this are less than 5 fathoms.

Pier.—About ½ mile northward of Kastrup Harbor is a pier extending for a distance of 790 feet in an easterly direction and belonging to the Danish Sulphuric Acid Works; it has a depth of 1¼ fathoms at its end. On the north side of its head is a stone mole, or breakwater, about 200 feet in length, in an east-and-west direction; the depth near this is about 1 fathom.

Kastrup Harbor is formed by two piers, the northern extending east and southeast for about 390 feet and the southern east and north-northeast for about 550 feet; the entrance between the heads is about 60 feet in width.

The harbor is approached through a dredged channel 1,250 yards in length, 130 feet in width, and with a depth of 2 fathoms, and the depths in the harbor are the same, but gales from the northeastward raise and those from the southeast and south lower the water about 3 feet.

The harbor for fishing boats is situated to the southward of this harbor.

Leading beacons.—Two leading beacons are situated near the harbor and to the westward of it.

The front beacon is white, surmounted by a red triangle, pointing upward.

The rear beacon, similar in every way except that the triangle points downward, is westward of the harbor and 243°, distant 275 yards from the front beacon.

The beacons in line bearing 243°, lead through the dredged channel.

Lights.—A fixed green light, elevated 10 feet, is shown from a white post on the north pierhead.

A fixed red light, elevated 33 feet, is shown from the front leading beacon, and a fixed red light elevated 49 feet, from the rear leading beacon.

All three lights are visible between the bearings of 197°, through west, and 291°.

Buoys.—The north side of the dredged channel is marked by five red spar buoys, each surmounted by a broom.

The south side is marked by three white spar buoys, each surmounted by a straw wisp, but these buoys are only laid out from April 1 to December 1.

Town.—The town, which is about midway between Copenhagen and Drägor, has a population of about 2,000. The works and chimneys are conspicuous and have been already mentioned; the limekiln fires may also be seen sometimes by night.

Communication.—There is a railway station, post, and telegraph offices at Kastrup.

Supplies.—Fresh provisions and water may be obtained. A crane will lift 2 tons, and an electric crane, lifting 1½ tons, has a depth of 1½ fathoms alongside it. A tug may be obtained during the time that the buoys are in position.

Kastrup Knæ and North Röse.—Immediately to the southward of the dredged channel to Kastrup the shore bank extends about 1.1 miles from the coast, and close to the 5-fathom contour line and on its edge is a shoal, the northern part of which is named Kastrup Knæ and the southern part North Röse. The former has a depth of 1¼ fathoms and the latter from 1¾ to 4¾ fathoms.

Light.—On North Röse is a circular granite tower, 56 feet in height and standing in a depth of 14 feet, which exhibits, at an elevation of 45 feet above high water, a light with fixed, flashing, group flashing, and occulting sectors, colored white, red, and green, for which see Light List.

The light is visible 12 miles, but the sectors showing to the southward have been reported to be interdistinguishable.

Fog signal.—A siren gives four blasts, each of 1½ seconds' duration every minute.

Lightbuoy.—A red lightbuoy, marked "Nordre Röse," and showing a group flashing green light, showing a group of two flashes every 10 seconds, thus: Flash, one and a half seconds; eclipse, one and a half seconds; flash, one and a half seconds; eclipse, five and a half seconds; is moored 600 yards 148° from North Röse Lighthouse, and when withdrawn for ice will be replaced by a red spar buoy.

Buoys.—Kastrup Knæ is marked, on its eastern side, by a conical red buoy, with three upturned brooms as top mark, moored in a depth of 3¼ fathoms.

Water-level signals are made from North Röse Lighthouse, from a mast with a yard, the balls with which the signals are made being hoisted on the western or eastern side of the mast, according as the level of the water is above or below mean sea level.

A pendant at the masthead, together with one of these signals, indicates that the depth shown by signal should be reduced by 3 inches. The day signals are as follows:

Signals.	Signification.
One ball at masthead	Mean sea level
One ball on yard close to the mast	8 inches above or below mean sea level.
One ball at yardarm	16 inches above or below mean sea level
Two balls on yard close to the mast	24 inches above or below mean sea level
Two balls at yardarm	32 inches above or below mean sea level

Night signals.—The lights by which these signals are made are shown below the main light, at elevations of 20 to 30 feet above sea level, and are visible from the bearing 158° through south, to 191°. When a white light is shown abreast of and level with the only or lower lantern of one of the signals, it denotes that the greater of the two depths shown should be reduced by 4 inches. The night signals are as follows:

Signals.	Signification.
One white light	Mean sea level or above.
One red light	Less than 8 inches below mean sea level.
One green light	Between 8 and 16 inches below mean sea level.
Two green lights (vertical)	Between 16 and 24 inches below mean sea level.
A green light over a red light (vertical)	Between 24 and 32 inches below mean sea level.
A green light over a white light	More than 32 inches below mean sea level.

Coast—Maglebylille Hook.—From Kastrup Harbor the coast trends in a southerly direction for 2¾ miles to Dragör, and from the former place, where the shore bank, with depths under 1 fathom, is less than 400 yards offshore, it increases its distance to about 1,200 yards, and is known as Maglebylille Hook, its center and broadest part being abreast Maglebylille; the eastern side of this flat is steep-to.

Buoy.—On the east side of Maglebylille Hook a red spar buoy, surmounted by two upturned brooms, is moored in a depth of 1 fathom.

Rasmus Möller, about 2 miles southward of Kastrup Harbor, is a rock on the edge of the shore bank above mentioned; Hesten, Rodstenen, and Ravnen are rocks on the same flat and near it; the rocks generally dry at low water, but Rasmus Möller does not show.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored, in a depth of 3¼ fathoms, 140 yards east by south of Rasmus Möller.

Beacons.—Near the shore, about 2 miles southward of Kastrup Harbor and ½ mile northward of Dragör, are two beacons, each consisting of a mast 100 feet in height and surmounted by a brown equilateral triangle. The eastern and western beacons, respectively, when in line with Dragör Church, indicate the limits on those sides of the channel through Hollænder Deep.

Dragör Harbor consists of two breakwaters, the northern having an easterly direction for about 1,150 feet, and the southern also easterly, but curving northeastward, for a total distance of 900 feet; there are three short arms inside, forming small basins, and the entrance, facing northward, between the breakwater heads is about 115 feet in width.

The harbor is approached through a dredged channel, nearly 200 yards in length and 154 feet in width, with a depth of 8½ feet, and the depth in the northern half of the harbor is about the same, but in the southern portion there are only from 3 feet to 1 fathom.

A rock with 2¾ fathoms lies about 600 yards east-northeast of Dragör Harbor light structure.

Light.—A fixed red light, visible 2 miles, is exhibited at an elevation of 8 feet above high water, from a square white structure, 4 feet in height, which is situated on the south breakwater head; it is shown from 16th July to 16th May when the harbor is clear of ice.

Buoys.—The northern side of the channel is marked by a red spar buoy, surmounted by one upturned broom, and the southern side by a white spar buoy, with a straw wisp; they are both in 1¼ fathoms water, and 140 yards from the entrance.

Water-level signals, visible in the direction of Drogden Lightvessel, are made at Dragör from a mast with yards, near the pilot house, the day signals being the same as those made from Nordre Röse Lighthouse; they are for the guidance of the pilots.

Night signals.—The night signals are as follows: When an additional white light is shown it has the same signification as at North Röse Lighthouse.

Signals.	Signification.
A red light over a white light (vertical).	Mean sea level or above.
Two red lights (vertical)----------	Less than 8 inches below mean sea level.
A red light over a green light (vertical).	Between 8 and 16 inches below mean sea level.
Two green lights (vertical)----------	Between 16 and 24 inches below mean sea level.
A green light over a red light (vertical).	Between 24 and 32 inches below mean sea level.
A green light over a white light (vertical).	More than 32 inches below mean sea level.

Pilots for the sound, or for the harbors on either side of it may be obtained; these pilots undertake uninterrupted pilotage from Bornholm to Falsterbö, through the sound to the Skaw. They can pilot vessels from the southward as far as Svinbådan Lightvessel. If, however, vessels wish to proceed past Svinbådan Lightvessel, pilots must be changed at Helsingör.

Communication.—The railway station, post, and telegraph offices are about 300 yards from the harbor.

South Röse.—The shore bank, with depths under 3 fathoms and steep-to, is about 200 yards eastward of Dragör Breakwater Heads, but from that it trends in a direction somewhat westward of south for 1⅝ miles, where it is 1¼ miles from the southeast coast of Amager, and a cluster of stones, with a least depth of 5 feet, is known as South Röse.

Buoy.—On the eastern side of South Röse a conical red buoy, surmounted by two upturned brooms, is moored in a depth of 4 fathoms.

Fort.—A fort is in course of construction on the edge of the shore bank, about 800 yards southward of Dragör Harbor, and from the southeast side of the fort a pier is erecting and conduit pipes are being placed; a dolphin will mark the northern and southern outer ends of the pier.

Light.—To mark the works an occulting green light, visible 3 miles, is exhibited at an elevation of 10 feet above high water; it is about 600 yards southward of Dragör Harbor Lighthouse, and about 300 yards eastward of the fort.

Buoys.—Kirkesten and Æblesten, two shoal spots with less than 1 fathom over them, lying on the shore bank southward of Dragör, are marked by red spar buoys, the former having two brooms and the latter one upturned broom as top marks.

Dragör Sandrevet.—From South Röse the 3-fathom contour line trends to the southwestward for 1¾ miles, forming a tongue, inside which is South Deep; the shoaler part of the tongue, with depths of from 1¼ to 1½ fathoms, is named Dragör Sandrevet.

Buoys.—Dragör Buoy, on the eastern edge of Dragör Sandrevet, is conical red, surmounted by an upturned broom, and moored in a depth of 4 fathoms.

A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 4 fathoms off Tungen, the southwest end of the sandrevet.

Coast.—From Dragör the southeast coast of Amager trends in a west-southwest direction for 3½ miles to Aflands Hook, the south extreme of that island; westward of Dragör Sandrevet the shore bank extends off this coast to the 3-fathom contour line for fully 1 mile, and the 5-fathom contour line is about 2 miles off.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 4½ fathoms, about 2½ miles southward of Aflands Hook.

A wreck with mast showing about 3 feet above water lies sunk 2 miles 193° from this buoy.

Drogden Channel—Eastern side.—Continuing the description of the shoal water extending westward of Saltholm, from Smaagrundene to the southward, the 2-fathom edge of this bank trends in a southwardly direction for about 5 miles, and near the middle of the island it passes about ½ mile off, being almost steep-to.

Smaagrundene, the edge of the bank 1½ miles westward of the north end of Saltholm, is steep-to, and a patch of 1½ fathoms lies on the edge of the 3-fathom contour line.

Buoy.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 6 fathoms, westward of Smaagrundene.

Knollen, a rock about 400 yards in length in a north and south direction, with a depth of 2¼ fathoms on its northern part, lies about ¾ mile off the edge of the bank, extending from Saltholm, the channel between having depths of from 5½ to 7 fathoms; it is about 1 mile southeast of North Röse.

Lightbuoy.—A white lightbuoy, carrying a bell, is moored in a depth of 6 fathoms westward of Knollen, and exhibits an occulting red light every 7 seconds.

Clearing mark.—Nicolaj Tower, in line with or open southwest of Frelser Church, bearing 310°, leads southwest of Knollen.

Kraasebænken (Kraase Bank) is that part of the edge of Saltholm Bank lying about 1¼ miles southward of Knollen; the 2-fathom and 3-fathom contour lines are here close to each other and steep-to, and between Kraasebænken and the shore of Saltholm there are some rocks.

Buoy.—A white can buoy, surmounted by one down-turned broom, is moored in a depth of 4 fathoms westward of Kraasebænken.

Holme Tongue, a small patch with a depth of 2 fathoms, lying about 200 yards inside the 3-fathom contour line, nearly 1 mile southward of Kraasebænken, is near the extreme of the shore bank, extending southwestward of Saltholm; the northerly current sets directly across this shoal.

Buoy.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 3¾ fathoms, 200 yards southwest of Holme Tongue.

Quartus Ground, about 400 yards in length, in a north and south direction, and 200 yards in breadth, lies fully 2 miles south-southwest of Holme Tongue, and has a least depth of 3¼ fathoms, over stones. There are depths of 3¼ and 3½ fathoms ½ mile north and north-northwest, respectively, and one of 3¾ fathoms about 400 yards south by west of Quartus Ground.

Clearing mark.—Frelser Church, in line with the southwest side of Maglebyville Remise, or grove, bearing 328°, leads east-northeast of these shoals.

Dragör Bro (Tærskelen) is the uneven and stony bottom which extends from Kraase Bank to Quartus Ground; a channel over it has not less than 22½ feet water.

Lightvessel.—Drogden Lightvessel, painted and masted in accordance with the Danish system, is moored on the southern side of the 3¾-fathom shoal south by west of Quartus Ground, and exhibits, at an elevation of 33 feet above the sea level, a group flashing white light, visible 11 miles. This lightvessel may carry two forestay lights instead of one.

Fog signal.—During thick or foggy weather an explosive fog signal gives two reports, in quick succession, every 10 minutes.

A bell is sounded for five seconds every minute; each tolling is concluded by a double stroke.

Radio telegraph.—Drogden Lightvessel is fitted with radio telegraph, the receiver hanging from a pole over the ball; it has a range of 300 miles, and the call letters are D N, but it is only for use by vessels in distress.

Pilots.—The lightvessel is a pilot station for Dragör, and pilots for Copenhaven and the sound and its harbors may be obtained; these pilots will take vessels either through Drogden or Flint Channels, and cruise to the southward of the lightvessel.

Current.—The current almost invariably sets to the southwest with northwest and southwest winds, but at the commencement of the latter wind it may set southeast if that wind has followed one from southeast. Vessels should not pass too close to the lightvessel on account of the current.

Lille Ground consists of two shoals, separated by a channel in which the least depth is 3 fathoms, the northern of the shoals, with

depths of from about 5 feet to 1¾ fathoms, being about 2½ miles southeastward of Drogden lightvessel; the southern shoal has from 1 fathom to 1¼ fathom over it, and near the center a patch of stones nearly awash.

Patches, with depths of from 3 to 3¾ fathoms, lie within a mile northward of Lille Ground, and their positions are best seen on the chart. Bred Ground, an extensive shoal southeastward of Lille Ground, is described in the next chapter.

Light and bell buoy.—A white light and bell buoy, marked "Lille Ground N. V.," and showing a flashing red light, the flash occupying about 5 seconds and the eclipse about 10 seconds, is moored 1.2 miles southeastward of Drogden Lightvessel, and when withdrawn on account of the presence of ice will be replaced by a white spar buoy.

Buoys.—A white can buoy, surmounted by one downturned broom and marked "Little Ground V," is moored about ⅔ mile westward of the 5-feet patch on Lille Ground North Shoal.

A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 5¼ fathoms, 1 mile southwestward of the shoalest head on the southern patch of Lille Ground.

Directions—Hollænder Deep.—Approaching Hollænder Deep from the northward, and having passed about half a mile eastward of Middel Ground Fort, bring Dragör Church ranging between the beacons on the shore northward of Dragör, bearing between 184° and 188°; the western beacon, in line with the church on the former bearing, clearing Middle Ground on the west, and the eastern beacon on with the church, on the latter bearing, clearing Saltholm Flat, Ryggen, and the dangers on the east side of the channel.

A vessel will be past Ryggen when Nyholm old crane is in line with the north side of Mellem Fort, bearing 273°, and might then keep somewhat closer to Saltholm Flat, the mark being a high gable at Dragör just open eastward of Dragör Water Tower, but these objects are not shown on the chart. The depth, when between the beacons in line with the church, should not be less than 6 fathoms.

By night.—The sector of fixed white light from North Röse, between the bearings of 179° and 181°, leads through the middle of Hollænder Deep.

Drogden Channel.—From the northward, through either Konge Deep or Hollænder Deep, and being as far south as Svælget, steer to pass 400 to 600 yards eastward of North Röse Lighthouse, and from abreast it alter course to have Drogden Lightvessel a little on the port bow. When Hollænderby Church is in line with Dragör Beacons, bearing 249°, bring the west side of Middel Ground Fort in line with the east side of North Röse Lighthouse, 352°, which, used as a stern mark, and steering 172°, will lead through the channel till

Hollænderby Church is in line with the north end of Dragör Grove, 301°, when a vessel may pass eastward of Drogden Lightvessel, with Frelser Church in line with the west side of Maglebylille Grove, 328°, using it as a stern mark, and steering 148°.

Or the channel to the westward of Drogden Lightvessel may be taken, with Middel Ground and North Röse Lighthouses in line, bearing 352°, as a stern mark, there being not less than 3¾ fathoms on this mark.

Vessels of deep draft should reduce speed when passing over Dragör Bro, and a vessel on the eastern side of the channel should guard against the northerly set over Holme Tongue already mentioned.

By night.—From the northward by night, a course should be shaped to pass in mid-channel between North Röse Light and that from the lightbuoy marking Knollen, and having passed between them, bring Middel Ground flashing white light in line with North Röse fixed white sector, bearing 352°, using them as a stern mark, which will lead in not less than from 3½ to 3¾ fathoms, and after passing on either side of Drogden Lightvessel, North Röse double flashing white sector brought in line with it, bearing about north, and used as a stern mark, is a good leading line to the southward so far as Falsterbö Point.

CHAPTER VI.

SWEDISH SHORE OF THE SOUND FROM LANDSKRONA SOUTHWARD TO FALSTERBÖ POINT WITH FLINT CHANNEL—COAST OF ZEALAND FROM AMAGER TO GRÖN SOUND.

Swedish shore—Lundäkra Bight.—Southward of Landskrona the coast recedes about 2¼ miles, and between it and Barsebäck Point, a distance of 7¼ miles, forms Lundåkra Bight, the northern part of which is filled by Skabb refvet.

The land surrounding the bight is much built over, but to a less extent in the southern part, toward Malmö. Dagstorp Church, about 5 miles inland, has a square tower.

The 5-fathom contour line, which is 2¼ miles southward of Landskrona, bends round the bight and is rather more than 1 mile from its eastern side, and off Barsebäck it is only ⅓ mile offshore; the bight has depths of from 6 to 10 fathoms, but is of little use to shipping.

Barsebäck, 7 miles southward of Landskrona, is a fishing village with a harbor formed by two piers extending in a westerly direction; there is a quay, 426 feet in length, with the same depth alongside as in the harbor, which is about 4½ feet at low water.

Light.—On the south pierhead a hexagonal-shaped white tower, 8 feet in height, exhibits, at an elevation of 15 feet above sea level, a fixed fishing light, with white and red sectors, visible 15 miles.

Communication.—Post and telephone at Barsebäck, 2½ miles distant; railway and telegraph at Keflinge, about 8½ miles.

Coal.—Some coal might be obtained, but no other supplies.

Trade.—Beet sugar is exported, and coal imported.

Barsebäck Point.—Barsebäck Point is a point situated ½ mile southward of Barsebäck Harbor, and from it a reef extends for ½ mile westward, terminating in Kulorna, a rock above water.

Light.—On Barsebäck Point an octagonal-shaped tower, 16 feet in height, exhibits, at an elevation of 17 feet above sea level, a group flashing light, with white and red sectors, the white light being visible 9 miles and the red 8 miles. (For sectors see Light List and Chart.)

Pinhättan, a small patch with 3½ fathoms water over it, lies 1¼ miles westward of Barsebäck Point, and is surrounded by depths of from 9 to 11 fathoms.

Lightbuoy.—A red lightbuoy, showing a flashing white light every three minutes, is moored on the west side of Pinhättan.

Buoy.—The west side of Pinhättan is also marked by a red spar buoy, surmounted by a down-turned broom under two balls.

Clearing marks.—Fosie Church, the lower part of which is surrounded by trees, open westward of Malmö Castle, bearing 150°, or Petri Church in line with the castellated tower of Malmö post office, leads westward of Pinhättan.

By night.—The line of obscuration of Hven Light, 330°, leads westward of Pinhättan, as also do the leading lights at Malmö, 148°.

Coast—Lomma Bight.—From Barsebäck Point the coast trends for 7 miles in a southeast direction and then sweeps around to the south-southwest, forming Lomma Bight. About 2 miles inland from its north side is Löddeköpinge Church and Mill, and near the shore, on its east side, is Lomma Church and cement works, with several chimneys; 4½ miles inland, on the east side, are Lund Cathedral, with two towers, and Lund new church, with a sharp spire and standing on high ground.

Uppåkra Church, 2½ miles southward of Lund, has a sharp black spire, and westward of it and 1 mile from the shore in Alnarp Castle, while southwestward of it is Arlöf sugar refinery and Kronotorp Mill.

On the south side of the bight is the town of Malmö.

Vikhög, a fishing village, with a harbor formed by a pier extending in a southeast direction, is 2¼ miles southeast of Barsebäck Point, with Saltviken, a small bay, between. The quay is 656 feet in length, of which 230 feet have the same depth alongside as in the harbor; a tramway for goods runs on the quay. There is a depth of about 4½ feet in the harbor at low water.

Light.—A fixed red light, with red and green sectors, is exhibited at an elevation of 15 feet above sea level, from a hexagonal white wooden tower on the pier end; it is shown from August 1 to January 1.

Communication.—The nearest post office is at Löddesköpinge, about 3 miles, but there is a telephone at Löddesborg, about ½ mile distant; the railway station is at Stäfvie, 5½ miles.

Supplies.—Some provisions and water may be obtained.

Trade.—The exports are beet sugar, and imports coal.

Löddesköpinge Roadstead is the anchorage off the mouth of Lodde Ån, a small river running into Lomma Bight, on which is Löddeköpinge, a town about 3 miles from the entrance.

Flädie Reef, on which the depth is 1¼ fathoms, lies a little more than 1 mile southward of the river entrance. A spar buoy surmounted by a down-turned broom marks the west side of Flädie Reef.

Anchorage.—The best anchorage is in depths of from 5 to 6½ fathoms, over clay bottom, with the east end of Löddeköpinge Wood in line with a house on the beach.

Lomma Harbor, formed by two piers extending in a westerly direction from the entrance to Höje Å, the southern and longer being about 2,625 feet in length, has a quay space of 1,150 feet, with the same depth alongside as in the harbor, which is 9 feet at low water.

Light.—On the north pierhead a white wooden tower, 10 feet in height, exhibits, at an elevation of 19 feet above sea level, a fixed light, with white, red, and green sectors; the white light is visible 5 miles, the red 3 miles, and the green 2 miles, but it is only shown from September 1 to May 1. (For sectors, see Light List.)

Anchorage.—Lomma Roadstead, the anchorage off the harbor, has depths of from 3¾ to 5½ fathoms, over clay and fine sand, with Fosie Church in line with Lembkes, the eastern of the two mills at Malmö bearing about 178°, and Lund Cathedral open north of the chimneys at Lomma 76°.

Small vessels anchor in about 3½ fathoms, with Fosie Church in line with the eastern tower of Malmö Waterworks.

Communication.—Lomma is a station on the line between Malmö and Helsingborg, and there are post and telegraph offices and a telephone to the coast-guard station.

Coal and supplies.—Coal, provisions, and water, in limited quantities may be procured.

Trade.—The exports are bricks and cement, and imports limestone and coal.

Approach to Malmö.—The northern approach to Malmö is between Pinhättan Shoal and Saltholm Flat, the distance between the former and the 5-fathom contour line of the latter being nearly 2½ miles.

Aspect.—There are four fairly conspicuous churches at Malmö. Petri, the nearest to the harbor, has a sharp spire and a smaller one at its eastern end; Caroli Church is eastward of Petri, and Pauli southeastward, while Johannes, southward of the town, has a tower which is square in its lower and octagonal in its upper part.

The most conspicuous object in the town is a large building, surmounted by two gilded domes, situated near the harbor, and the chimney of the spinning mill; the square tower of the post house, the Vals Mill, and Malmö Castle are all good marks. It is possible to mistake a red brick tower for the high lighthouse, as it is situated near it.

Eastern side.—The east side of the approach has been already described, except that on the south side of Lomma Bight the shore bank and shoal water extends for a distance of 2 miles within the depth of 5 fathoms.

Buoy.—A spar buoy, surmounted by two upturned brooms, marks the western edge of the above shoal water.

Western side.—Saltholm has also been described with Drogden Channel, and Saltholm Flat, which forms the southwest side of the approach to Malmö, extends northward from the island for a distance of 4 miles, to the 5-fathom contour line; the same contour line is 3¼ miles northeast and about 2¼ miles eastward of the north point of Saltholm.

A 6-foot rock lies just within the 5-fathom contour line on the eastern edge of Saltholm Flat abreast the northern end of North Flint Shoal.

Northward of Saltholm there are depths of from 1¼ to 2¾ fathoms on the flat for a distance of about 2¾ miles, and near the extreme a fort is building.

Buoys.—The northeast side of the flat is marked by a conical red buoy, surmounted by an upturned broom, situated in a depth of 2½ fathoms, about 1¼ miles north-northeast of the north point of Saltholm.

A black spar buoy, with a basketwork ball, is moored in a depth of 6 fathoms, about 3 miles east-northeast of the north point of Saltholm.

Lightbuoy.—A black lightbuoy, marked "S.F.-N.Ø," and exhibiting a group flashing white light, showing a group of two flashes every 10 seconds, is moored northeastward of Saltholm Flat black spar buoy, and when withdrawn on account of ice will not be replaced by a winter sea mark.

Dangers.—Saltholm Flat extends about 1¾ miles off the eastern side of Saltholm, and eastward of it a group of shoals, about 2¾ miles in length in an east and west direction, and 2 miles north and south, form the western side of the approach to Malmö.

Björnen, the northern of the inner of these dangers, is 800 yards in length in a north-northeast and opposite direction, and 400 yards in width, with a least depth of 1 fathom over it; a shoal with depths under 5 fathoms, with a patch with a depth of 2¾ fathoms on it, extends about ¾ mile northward of Björnen, the whole being about ½ mile eastward of the eastern edge of Saltholm, with a channel between in which the depths are from 6 to 7 fathoms.

Buoys.—A conical black buoy, surmounted by two balls, and with "Björnen N." on it, is moored eastward of the 2¾-fathom patch on the shoal extending north of Björnen.

A conical black buoy, surmounted by three balls, and with "Björnen Ø" on it, is moored eastward of the depth of 1 fathom on Björnen.

North Flint, separated from Björnen by a channel 600 yards in width, and depths of from 5½ to 6 fathoms, is ⅝ mile in length in a

north and south direction, and has general depths of from 1¼ to 2 fathoms, but a patch toward its southern end is awash.

Lightbuoy.—The southeast side of North Flint is marked by a black lightbuoy, showing a flashing white light, with a period of five seconds. It may be withdrawn if ice conditions render it necessary.

Buoy.—Eastward of the lightbuoy, and nearly 400 yards from the edge of the shoal, is a black spar buoy, surmounted by two basket-work cages.

Gustaf af klint, the shoalest part of which lies about ¾ mile eastward of the channel separating Björnen and North Flint, is 1.3 miles in length in a northeast and opposite direction, within the 5-fathoms contour line, and 1,100 yards in breadth; the least depth over it is 1¾ fathoms, near the west side, but the general depths are from 3½ to 4 fathoms.

Kupan, a detached patch of 3 fathoms, lies about ½ mile north of the shoalest spot.

Detached patches, Mark Ground with 3½ and Vajan with 3¼ fathoms over them, lie 600 yards northwest and 800 yards west, and there is a 2¾-fathom spot on the main shoal 700 yards southward of the shoalest depth.

Within a radius of about ¾ mile north and northeast of Gustaf af klint are several detached patches of from 4 to 5 fathoms. A 4½-fathom shoal lying 1.4 miles northward of Gustaf af klint is known as Utposten.

Buoys.—The southwest side of Gustaf af klint, 1,200 yards southward of the shoalest part, is marked by a red spar buoy surmounted by an upturned broom over a ball.

Mark Ground is marked by a red spar buoy surmounted by an upturned broom.

Kupan is marked on its western side by a red spar buoy surmounted by a ball between two upturned brooms.

Vajan is marked near its center by a conical black and red horizontally striped buoy.

Sjöllen, the eastern of these dangers, is nearly 1½ miles in length in an east-northeast and opposite direction and ½ mile in greatest breadth, and in most places composed of stones. It has general depths of from 2 to 2¾ fathoms over it, but a least depth of 1¼ fathoms near its southwest end.

Buoys.—The northeast side of Sjöllen is marked by a black spar buoy with a white band and surmounted by two balls.

A black spar buoy with a white band and surmounted by a ball is moored about 200 yards from the east side.

The southeast side is marked by a black spar buoy with a white band.

A red spar buoy surmounted by an upturned broom under a ball is moored off its southwest end.

Clearing marks.—Frelser Church (Copenhagen), in line over the north extreme of Saltholm bearing 270°, or Lund Cathedral (Sweden), well open northward of Lomma Church, 78°, leads northward of these dangers.

The eastern tower of Malmö waterworks, in line with Malmö High Lighthouse, bearing 99°, leads southward.

Uppåkra Church open of the south end of Alnarp Wood, bearing 74°, or Dagstorp Church, midway between Löddeköpinge Church and mill, bearing 20°, leads southeastward.

Fosie Church in line with the mill to the westward of Malmö Castle, bearing 151°, leads northeastward.

Pilot Lightvessel.—A Pilot Lightvessel, with a red hull, and "Lots" on both sides, is moored about 1,800 yards eastward of the northeast end of Sjöllen, and exhibits a fixed white light; the vessel will only be withdrawn when necessitated by ice.

Fogsignal.—A fog bell will be sounded four times every two minutes, and this bell will be used to answer signals from passing vessels.

An explosive fogsignal will give one report every four minutes when a steamer is expected and will be in operation for half an hour.

Pilot signals—By day.—When pilots are on board a blue and white flag will be hoisted at the masthead.

By night.—When pilots are on board two fixed white lights, placed vertically, will be shown at the gaff and a riding light will be hoisted.

When no pilots are on board one fixed white light will be hoisted at the gaff.

Malmö Roadstead.—The anchorage in Malmö Roadstead, east-southeast of the pilot lightvessel, is in depths of from 7 to 8 fathoms, over a bottom of stiff blue clay, anchoring on the line of Uppåkra Church, just open of the south end of Alnarp Wood, bearing 74°, and the best berth for communicating with the shore is with the inner lighthouse in line with the eastern lighthouse, 162°. The British ship *Cornwall* (1909) found good anchorage with the high lighthouse bearing 117°, distant 1½ miles, and Malmö Castle mill 155°.

Malmö Harbor consists of an outer and inner harbor and an eastern basin, formed by a pier on the west side, extending about 200 yards in a northerly and the same distance in a northeasterly direction. On the east side a breakwater, which forms the northern side of a new harbor, extends in a general west-northwest direction for nearly 1 mile, and between it and the west pier is a detached curved breakwater, with inside it the east pier, about 300 yards in length, its western end being the east side of entrance to the harbor.

On the southwest side of the Outer Harbor is an entrance for large vessels into a wharf basin, and the construction of a free harbor is proposed.

The harbor is entered through a dredged channel; between the outer harbor and the eastern basin there is a length of about 1,200 feet of quay available for steamers, besides more than 4,000 yards of other quay space; the railway runs on the quays.

Near the outer end of the new basin is a floating breakwater, about 140 feet long, consisting of three floats; under ordinary circumstances it is moored between two buoys in the line of the basin, but with strong northwesterly winds it is moved to between the outer warping buoy and the quay, when vessels must keep on the northeast side of the basin.

Lights.—The high light, exhibited at an elevation of 68 feet above sea level from a white iron tower 66 feet in height, with two red bands, situated on a small pier on the west side of the entrance to the Inner Harbor, is a white light, showing fixed, flashing, and group flashing (two flashes) sectors visible 14 miles. (For sectors, see Light List and Chart.)

West pierhead.—A white iron tower on the west pierhead exhibits, at an elevation of 32 feet above sea level, a fixed, flashing, and group flashing light, with white and green sectors; the white light is visible 10 miles and the green light 6 miles.

The high and west pier lights are leading lights when in line, bearing 148°, and are 520 yards apart.

East pierhead.—An unwatched flashing red light is exhibited, at an elevation of 32 feet above sea level, from the east pierhead.

Fog signal.—A foghorn on the west pierhead gives one blast of 5 seconds duration every 30 seconds. It is sounded during thick or foggy weather from 6 a. m. to 10 p. m., and also after the latter hour when regular ferry, mail, or passenger steamers are expected.

Storm signals are shown from two different positions at Malmö, one mast being at the Inner Harbor; storm warnings are also posted up.

Ice information is posted up daily, during winter, at the harbor captain's office.

Beacon.—A beacon, consisting of two uprights, with horizontal boards between, situated on the west pierhead, is used as a mark for placing Oskarsgrund Lightvessel.

Steam-ferry lights.—When the ferry steamer is expected two fixed green lights placed vertically are shown at the west pier and two fixed red lights, similarly placed, at the east pier.

A fixed white light is shown from each end of the floating breakwater in the new basin.

Bridge signal.—A semaphore arm with light, elevated 39 feet, has been established on the east side of the channel to the dock basin, near the swing bridge.

When bridge is open a green light will be shown both toward the outer harbor and toward the harbor basin, and the semaphore arm will be lowered. When bridge is closed a red light is shown and the semaphore arm raised to horizontal.

Dredged channel.—The dredged channel to the harbor is over 1,600 yards in length in a 329° and opposite direction, and 197 feet in width.

Depths.—The depth in the dredged channel is 23½ feet, in the outer harbor 3½ fathoms, and in the inner harbor 20 feet; dredging is in progress (1911) to increase the depth in the entrance to 24 feet.

Buoyage.—Off the entrance to the dredged channel, north-northwest of the pierheads, are the following buoys:

Lightbuoy.—A red lightbuoy exhibiting a flashing white light every two seconds.

Bellbuoy.—A red bellbuoy.

Buoy.—A red and black spar buoy, surmounted by a globe; this buoy is known as Röderprick.

The eastern side of the dredged channel is marked by seven spar buoys, surmounted by down-turned brooms, over cylindrical-shaped blocks of wood.

The west side of the dredged channel has six conical black buoys.

The channel buoys have cylindrical-shaped wooden blocks under the perches as distinguishing marks.

Pilots.—Malmö is a pilot station, and pilots look out from the port and from the pilotage vessels and the lightvessel; they meet inward-bound vessels, who may not already have obtained a pilot, in the roads.

Directions.—Having passed Pinhättan, a vessel should steer for the pilot lightvessel or for the anchorage in the roads, attending to the clearing marks already given, and if entering the harbor the light, bell, and spar buoys off the entrance should be left to the eastward, and it is only necessary to pass between the buoys marking the sides of the dredged channel and between the pierheads into the harbor, avoiding the floating breakwater by keeping on the northeast side of the basin, should it be out of its usual position.

By night.—Steer for the sector of fixed light from the high lighthouse, bearing 148°, when it should form a leading light with the west pier light, which leads about ¾ mile southwestward of Pinhättan, ½ mile eastward of the pilot lightvessel, and through the dredged channel.

Submarine vessels may be met with between Saltholm and Hven. (See Chapter I.)

Current signals.—For the information of the ferry steamer the following signals are made from a post on the eastern pierhead:

By day.—A horizontal arm points in the direction in which the current is setting.

By night.—The signals are made by lantern lights.

A red light indicates a southwest-going current.

A green light indicates a northeast-going current.

A white light denotes that there is no current.

Submarine cables.—Telegraph and telephone cables cross the harbor in certain places, and the positions of the shore ends are indicated by broad red streaks painted on the quays; a notice board regarding anchorage is placed westward of the inner lighthouse.

Ice.—In 1893 the harbor was closed for six weeks, but it has remained open since 1903.

Town.—The town of Malmö, and capital of Skåne Province, was the chief commercial town of the Sound in the Middle Ages and still has a brisk trade. A bridge from the harbor leads southward to the Stor-Torg, or great market square, in which is the governor's residence and the town hall, a handsome building in Netherlandish renaissance style.

On the west side of the town is Kung Oskar's Park, and beyond it the Malmöhus, a sixteenth century fortress. Beyond the costle moat is Slotts Park, with a museum on its east side. There is also a botanic garden.

The population was 92,338 in 1912, and the town is lighted by electricity. The United States is represented by a consular agent.

Communication.—The Wilson Line of steamers has a fortnightly service with Grimsby, and there are daily steamers to Lübeck, and three times every day to Copenhagen. Steamers also run between Malmö and Stockholm, Göteborg, etc., and others touch at the port en route to Amsterdam, Bordeaux, etc. The landing place for those from Copenhagen and Lübeck is at the inner harbor quay, but the steam ferry between the port and Copenhagen lands at the east basin.

There are lines of railway in almost every direction; northward to Landskrona and Helsingborg, northeast to Norkoping, southeast to Ystad, and south to Trelleborg, besides several other railways. The main station for trains to Göteborg, Stockholm, Trelleborg, etc., is close to the steam ferry landing, and that for Ystad, Hvellinge, Trellborg, etc., is westward of the harbor. The post office is on the quay, but the telegraph is in a street known as Norra Vallgatan.

There are nearly 4 miles of tramway lines.

Coal and supplies.—About 35,000 tons of coal are kept in stock, of which 15,000 tons belong to the State railways, and about 110,000 tons are imported annually; the coal wharves are 700, 250, and 250

feet in length, with depths of 18 feet alongside, and 400 tons could be put on board in 24 hours. Coaling is carried on by baskets, and there are 13 lighters, 2 of which are kept loaded.

Fresh provisions may be procured, and water, which is brought from a distance of 5 miles, from a water boat.

Docks and patent slip.—

Name of dock.	Length.		Breadth of entrance.	Depth at H. W. O. S.		Lifting power.	Date built.	Remarks.
	On blocks.	Over all.		On sill.	On blocks.			
						Tons.		
Harbor Commissioners Dry Dock.	235	235	34	12	12	.....	.....	*Malmö.*—By special arrangement a vessel of 236 feet length of keel can be docked.
New Dock.....	511½	523	78½	23½	20½	.....	1912	
Patent Slip (Kockums).	230 (cradle).	.....	42 (cradle).	Forward. 8 Aft..... 14		1,300	.....	

Repairs.—Repairs to vessels of war can only be executed at Kockum's Mekaniska Verkstad, where there are cranes lifting 20 and 10 tons; a stationary crane in the harbor lifts 15 tons.

Time signal.—A time signal is made, at the School of Navigation, from an elevation of 67 feet above the ground and 77 feet above sea level. It consists of a black ball, which is dropped at Greenwich mean noon, or 1h. 0m. 0s. mid-European time, the standard time of Sweden; the ball is hoisted close up five minutes before it falls.

Trade.—Malmö is a flourishing port and a chief center of the export of dairy produce; it has factories for the manufacture of tobacco, sweets, chocolates, and coffee substitutes, and a wool factory has nearly 400 looms. The principal exports are cement, chalk, meal, and agricultural produce, the imports being coal, grain, etc.

Coast.—From Malmö the coast trends in a west-southwest direction for about 2 miles, to Limhamn; the 5-fathom contour line, which is 1,600 yards distant in a northwest direction from the pierheads, closes the coast to half a mile when immediately eastward of Limhamn, and there turns to the westward and northwestward across the northern part of Flint Rännan, the depths being less to the southward.

Buoy.—Nearly 1½ miles westward of Malmö pierheads a conical red buoy, surmounted by a broom, marks the edge of the 5-fathom contour line.

Aspect.—Near Limhamn some chimneys and a mill may be seen, and southward is Hyllie Church, standing on high ground with a square white tower which has a sharp dark spire; Hyllie Mill is southeastward of the church.

Fosie Church, with a square white tower surmounted by a high spire, is about 2 miles eastward of Hyllie Mill, and about 1¼ miles west-southwest of the mill is Annetorp Wood, with Bunkeflo Church, also having a square white tower, which is surmounted by a dark spire.

Limhamn is a good harbor, formed by a breakwater 1,137 yards in length in a north-northeast direction, almost parallel to the shore, from which it is distant nearly 250 yards, with piers extending from the shore in a northwest direction, toward each end of the breakwater, leaving an entrance between at either end. Other piers extend in a similar direction from between the end piers, forming basins. The pier which extends toward the northern end of the breakwater is 1,312 feet long, and the entrance between its end and the breakwater is 164 feet wide.

Lights.—From the north end of the breakwater a flashing light, with white, red, and green sectors, is exhibited at an elevation of 26 feet above sea level; the white is visible 7 miles, the red 5 miles, and the green 4 miles. (For sectors, see Light List.)

A flashing red light is exhibited, at an elevation of 26 feet above sea level, from a white iron framework situated on the southern end of breakwater.

Depths.—In the dredged channel of the northern entrance, and in the northeast part of the harbor, there is a depth of 20 feet; in the southwest part 10 feet, at low water.

Beacon.—On the northern pier end is a pole beacon, 10 feet high, with a white band, and surmounted by a barrel.

Buoys.—On the western side of the northern entrance channel is a black spar buoy, surmounted by a ball, and between it and the north end of the breakwater a plain spar buoy is moored on the same side of the channel.

On the east side of the entrance channel are two spar buoys, surmounted by down-turned brooms.

The eastern side of the southern entrance is marked by a conical red buoy, and by two spar buoys, each surmounted by two down-turned brooms.

The western side is marked by two black can buoys.

Tugs.—There are two tugs.

Pilots can be obtained.

Anchorage.—Limhamn Roadstead affords anchorages in a depth of about 4 fathoms, with Petri Church (Malmö) in line with Ribersborg House, bearing 75°, and Hyllie Mill open southwest of Limhamn Mill 122°.

Directions.—If entering by the northern entrance, the light tower (white, with two red bands) on the north end of the breakwater, should be steered for, bearing 205°, which leads to the entrance of the dredged channel, when pass between the buoys on either side of it.

For the southern entrance Hyllie Mill should be steered for just open southwest of Limhamn Mill, bearing 126°, which leads to the entrance of the buoyed channel.

By night.—The sector of white light from the lighthouse on the north end of the breakwater, bearing between 201° and 220°, leads to the entrance.

Storm warnings are posted up at Limhamn. (See Chapter I.)

Communication.—A branch railway from Malmö passes through Ribersborg to Limhamn; there is a post and a telegraph office, and a telephone to the coast-guard station.

Coal and supplies.—Some coal might be obtained, and provisions and water are procurable.

Dock.—There is a small drydock; length over all, 117 feet; breadth at entrance, 27 feet; depth on sill at H. W. O. S., 6 feet.

Repairs.—Slight repairs might be effected at a workshop, where there is a lathe; a crane will lift 5 tons.

Trade.—The principal exports are limestone, cement, glass, and manure; and imports, coal, gypsum, and salt.

Coast—Dangers.—The coast southward of Limhamn will be found described below, but within a distance of 2½ miles southwest of Limhamn are the following dangers, extending about 1½ miles offshore. About ¾ of a mile south-southwest of Limhamn is a pier extending 600 yards in a north-northwest direction.

Lernacken.—The shore bank from the south end of Limhamn breakwater gradually draws off the coast, and 2 miles southwestward of the harbor and westward of Annetorp Wood it is 1 mile off; Lernacken is the fringing shoal water, with depths under 3 fathoms, which here extends nearly 1½ miles from the coast.

Skälör, a rock awash, is situated on the shore bank 1,400 yards from the coast westward of Annetorp Wood. A red and black spar buoy is moored 1,300 yards west by north of Skälör.

Trindelen, a shoal 1,800 yards in length, in a northeast and opposite direction, within a depth of 3 fathoms, and 400 yards greatest breadth, has a least depth of 1 fathom over it; a number of detached patches, with depths of from 1¾ to 3 fathoms, which lie northeastward and southwestward of Trindelen will be seen on the chart.

Buoy.—A red spar buoy, surmounted by two upturned brooms, is moored 800 yards westward of the south end of Trindelen.

Flint Channel (Flint Rannan), which lies between the Swedish coast, from Malmö to Klagshamn, with the shoals off it on the east, and Saltholm Flat and the group of shoals eastward of it, with the shoal extending southeast of Amager on the northwest, is about 8 miles in length, and less than 1 mile in breadth in its narrowest parts.

Depth.—At lowest water a greater depth than 23½ feet can not be depended on, and it is possible that stones may be moved by drift ice on to the line of the leading mark.

Southeast side.—Kalkgrundet, which lies nearly in the middle of the northern part of Flint Channel is about 600 yards in length in a northeast and opposite direction, and 300 yards in width; it is composed of limestone covered with seaweed, has a least depth of 1½ fathoms, and is steep-to all around.

Lightvessel.—A lightvessel, having a red hull, with "Kalkgrundet" on the sides, and a tower, is moored, in a depth of 5 fathoms, on the northwest side of the shoal, and exhibits, at an elevation of 22 feet above sea level, a group occulting white light, visible 10 miles.

Fog signal.—During thick or foggy weather a fogbell is sounded three times in quick succession every two minutes.

Buoys.—Kalkgrundet is marked by three buoys:

On the northeast side by a black and white buoy, surmounted by a staff and ball.

On the south side by a conical black and white buoy.

On the southwest side by a red spar buoy, surmounted by a broom.

Clearing marks.—Bunkeflo Church, seen between Limhamn Mill and the Home for Children, bearing 152°, leads eastward. Oskarsgrundet and Drogden lightvessel, in line 243°, lead southeast.

Hyllie Church in line with the western side of Falks House, a red two-storied house in Limhamn, easily recognized, about 130°, leads southwest.

The sector of single flashing light from Malmö west breakwater covers Kalkgrundet.

Oskarsgrundet, southwest of Kalkgrundet, and composed of flints, chalk, and bowlders, is 2.4 miles in length in a northeast and opposite direction, and nearly 1,800 yards in greatest width, within the 4-fathoms contour line; the shoalest spot, with a depth of 3 fathoms, lies about 1½ miles in a west-southwest direction from its northeast end, and the bottom is flint, chalk, and bowlders.

A detached patch, with a depth of 3½ fathoms, lies 200 yards northward of Oskarsgrundet, and 800 yards southeastward of Saltholm east buoy.

Lightvessel.—Oskarsgrundet Lightvessel, moored about 200 yards westward of the shoal, in a depth of 4½ fathoms, has a red hull, with "Oskarsgrundet" on the sides, and a tower; it exhibits, at an elevation of 36 feet above sea level, a fixed white light, visible 11 miles.

Fog signal.—During thick or foggy weather a fogbell is sounded twice in quick succession every two minutes.

Tidal signals.—The following signals on Oskarsgrundet Lightvessel indicate the direction of the tidal streams in Flint Channel when the velocity exceeds 2 knots per hour.

South-going stream.—A black ball at anchor davit and a fixed red light shown above the fixed white anchor light.

North-going stream.—A black double cone at anchor davit and a fixed green light shown below the fixed white anchor light.

Shoal patches.—On the line of Kalkgrundet and Oskarsgrundet lightvessels in one and 1,200 yards southwestward of the latter, is a patch with a depth of 3¾ fathoms, with another of the same depth 300 yards north-northwest of it; nearly 600 yards westward of this first patch is another, with 2¾ fathoms water over it; about 2.4 miles 285° from Limhamn flashing light is a pack of 3¼ fathoms and 2.8 miles 279°, and 3.8 miles 253° of same light are patches of 3 and 3½ fathoms respectively.

Northwest side.—The group of shoals which lie eastward of Saltholm Flat, and form the west side of the northern entrance, have been already described as also forming the western side of the approaching to Malmö.

Svaneklapper.—Southwestward of this group, and extending about 1¼ miles southeastward of Saltholm, are Svaneklapper, some islets always above water and covered with grass, lying on the southeast edge of Saltholm Flat, which curves around to the southwestward and westward at about 1¼ miles southward of Saltholm.

Southern Flint, a ridge of sand and stones, about 1⅛ miles in length in a northeast and opposite direction, and nearly 600 yards in greatest width, lies about 800 yards off the southeast edge of Saltholm Flat, the channel between having depths of from 3 to 3½ fathoms. The general depths over the ridge are from 1 fathom to 2½ fathoms, but near the northeast end is a patch 400 yards in length, with a heap of stones awash.

Lightbuoy.—A lightbuoy, painted black, exhibiting a group flashing white light, two flashes in each group, is moored about 100 feet northwestward of the leading line, and about 950 yards southwestward, from Oskarsgrundet lightvessel.

This buoy marks the eastern side of a 3½-fathom shoal situated 150 yards north-northwestward of the leading line.

Buoys.—The southeast and southern sides of Saltholm Flat are marked by three buoys, lying at the following distances from the southeast point of Saltholm:

Saltholm east buoy is conical black, and surmounted by a cage; it lies about 3 miles eastward.

Southern Flint Buoy, black, and surmounted by two cages, lies about 2⅓ miles southward.

Saltholm South Buoy, black, and surmounted by three cages, lies 2 miles southward.

Shoal.—A 3¾-fathom shoal is situated 100 yards northwestward of the leading line, 1.9 miles northeastward of "Lillegrund N. V." Lightbuoy.

Directions.—Having followed the directions for Malmö as far as and passing eastward of the pilot lightvessel, steer 229°, with Kalkgrundet and Oskarsgrundet Lightvessels in line, which leads through the channel, leaving the lightvessels on the port hand, and when south of Oskarsgrundet Vessel, still keeping them in line as a stern mark, 49°, until Drogden Lightvessel comes in line with North Röse Lighthouse, bearing 350°, when the vessel will have passed south of Lillegrund N. V. Lightbuoy and be clear of the channel.

Limhamn northeast chimney, between Petri and Caroli Churches (Malmö), bearing about 67°, leads northward, and Marmor Church (Copenhagen), midway between Frelser and Dragör Churches, 341°, leads westward of Lillegrund. The leading line passes over a depth of 3½ fathoms at a distance of 600 yards northeastward of Lillegrund N. V. Lightbuoy.

A vessel by day may pass through the channel between Gustaf af Klint and Sjöllen on the east and Björnen and Northern Flint on the west side, and a sailing vessel with a westerly wind would find it advantageous to do this, but there being no leading mark the whole dependence is on the buoys.

The directions should be reversed when coming from the southward.

By night the lights from the lightvessels will lead through the channel until Drogden Light is in line with North Röse Light.

A sailing vessel from the northward may work in the fixed sector of Malmö High Light, between the bearings of 134° and 152°, remembering that the single flash shows over Pinhättan and Kulorna, and the double flash over the northeast edges of Saltholm Flat and of Sjöllen.

Klagshamn, about 4 miles southward of Limhamn, has a pier from the limestone quarry and cement works extending for fully 1 mile in a westerly direction, and on the northern side of its outer end a short curved arm forms the harbor, which is approached through a dredged channel, and has 1,200 feet of quay.

Light.—On the pier end a white iron tower, 11 feet in height, exhibits, at an elevation of 18 feet above sea level, an occulting light, with white, red, and green sectors; the white light is visible 6 miles, and the red 4 miles, and green 3 miles. (For sectors, see Light List.)

Range lights.—Front light, flashing white, exhibited at a height of 29 feet above the sea. Rear light, occulting white, exhibited at

height of 49 feet and 164 yards 77° from front light. These lights are to be established at Klagshamn.

Depth.—There is a depth of 15¼ feet in the harbor, at the lowest water, and the same depth in the dredged channel.

Buoys.—The northern side of the dredged channel is marked by three spar buoys surmounted by upturned brooms.

The southern side of the channel has three black spar buoys surmounted by balls.

Communication.—There is a railway station about 2 miles from the harbor, and post, telegraph, and telephone offices.

Supplies of provisions and water may be obtained.

Trade.—The exports are limestone, flint, cement, and manure; imports, coal and gypsum.

Coast.—From Klagshamn the coast trends to the southward for a distance of 6 miles and then curves round Höllviken, 2½ miles wide, and turns to the northward for 2 miles to Knösen, from which it has a south-southwest direction for 3¾ miles to Falsterbo Point, the southwest extreme of Skanör Peninsula.

Skanör Church, on the north side of the town, is white, with a black roof and a low tower in stepladder form; Falsterbo Church, on the south side of that town, has a somewhat similar tower; both these churches are surrounded by plantations, which from a distance appear as small islands.

Southward of Klagshamn the shore bank is about 1 mile offshore, and the 3-fathom contour line, which passes close to Klagshamn Pierhead and 1¼ miles offshore, continues at that distance for about 2 miles, and then draws off and takes a southwest direction round Knösen, at a distance of 1½ miles from it.

Beacons.—A mill stands on the south side of Skanör town, and near the north end of the island off the town is a beacon 46 feet high, square, and with a white square board as a top mark. This beacon in line with the mill clears the northeast side of Bred Ground.

On the south side of Skanör Peninsula and eastward of Falsterbo town is a brown beacon 28 feet high, surmounted by a white disk.

Northward of the town is a small black beacon surmounted by a barrel.

Höllviken, northward of Skanör Peninsula, is about 2 miles square, with a general depth of 2½ fathoms; it affords good anchorage for vessels of about 11 feet draft, and is sheltered except from the northward.

Dangers.—Outside the 3-fathoms contour line, between Klagshamn Pier and Knösen, are several shoals, with depths of from ¾ fathom to 3 fathoms over them.

West Haken and Tolken, on which the depths are about ¼ fathom, are the extension of the shore bank in a northwest direction

from Knösen, the extreme of Tolken being about 1½ miles distant from the point.

Ko Ground, about 1 mile in length in a north-northeast and opposite direction, with a breadth of nearly 800 yards, is separated from Tolken by a narrow channel, in which there is a depth of 3½ fathoms, and has ¾ fathom water over it.

Between the north end of Ko Ground and Klagshamn Pier are several patches, which will be best seen by referring to the chart.

Buoy.—The western side of Ko Ground is marked by a red spar buoy, surmounted by an upturned broom under a ball.

Bred Ground.—This is a dangerous shoal extending from Ko Ground within a radius of about 2 miles from northeast through north to south by west of Ko Ground. It is composed of rocks and stones and the depths vary from 1 foot to 3 fathoms. The latest edition of the chart should be consulted before approaching this dangerous locality.

Light.—An unwatched flashing white light is exhibited from a pole on the middle of the eastern edge of the shoal.

Detached shoals.—About 600 yards westward of the western edge of Bred Ground are two patches with 2¾ fathoms water over them, the southern named Virago Ground, and the northern Ramsan.

Medea Shoal, with a depth of 3¾ fathoms over it, lies 1⅞ miles westward of Bred Ground.

Ryn Korna, a shoal with 2¾ fathoms of water over it, lies with Skanor Light bearing 154° distant 1,700 yards.

Buoys.—The shoal on its western side, is marked by the following buoys:

Sporren, a 3-fathom patch off the northwest edge by a red spar buoy, surmounted by a ball between two upturned brooms.

A black and white spar buoy, with ball, situated 1,200 yards northeastward of the above, marks the southeast extreme of Lille Ground.

Ramsan, on its northwestern side, by a red spar buoy, surmounted by an upturned broom over a ball.

Virago Ground, by a red spar buoy, with an upturned broom under a ball as a top mark.

About 1¼ miles from the southwest edge a red spar buoy, surmounted by an upturned broom over two balls.

A black and white spar buoy, with ball, is situated on the southern part of Bred Ground, and a similar buoy close eastward of the lighthouse. A black and white conical buoy with two balls lies with the lighthouse bearing 202°, distant 1⅞ miles. A shoal in the channel to Skanör is marked by a spar buoy.

Directions.—Drogden and North Röse Lights in line, bearing 351°, lead westward.

Inner Channel—Directions.—There is an inner buoyed channel, about ¾ mile in breadth, with a least depth of 3½ fathoms, between the north end of Bred Ground and Lille Ground, which may be used.

Petri Church, open of the north side of Annetorp Wood, which latter has two large barns at its southeast side, bearing 49°, leads through the channel, and when Frue Church (Copenhagen) is open eastward of Dragör Pier Lighthouse, 324°, steer 15° for Oskarsgrundet Lightvessel if bound to the northward.

By night.—The green sector of Klagshamn Light, bearing 71°, leads through this channel.

Skanör Hamn, on the west side of Skanör Peninsula, is formed by two piers at the end of another, which extends about ½ mile offshore; the southern and longer pier is in a semicircle, bending around northwest and north, the entrance having a north and south direction. There is about 600 feet of quay.

Light.—A group flashing light, with white, red, and green sectors, is exhibited, at an elevation of 14 feet above sea level, from a hexagonal white tower, on the north pierhead; the white light is visible 8 miles and the red and green lights 7 miles. (For sectors, see Light List.)

Depth.—The least depth at low water is 6½ feet in the entrance and the harbor and alongside the quay the depth is about the same.

Buoy.—A buoy, surmounted by a ball, is moored northward of the harbor.

Pilots may be obtained.

Communication.—A branch railway connects at Harslöf with the line between Malmö and Trelleborg, and in the town is a post and a telegraph office, a telephone connecting with the coast-guard station.

Supplies of provisions and water in small quantities may be obtained.

Storm warnings are posted up at Skanör. (See Chapter I.)

Life-saving station.—A lifeboat is stationed at Skanör.

Trade.—The exports are inconsiderable, and imports coal, wood, and bricks.

Skanör Roadstead, about 1 mile from the harbor, affords anchorage sheltered from easterly winds, in a depth of 3¼ fathoms, with good holding ground of sand and clay, avoiding the detached shoal, Rynkoma, already mentioned, with a depth of 2¾ fathoms, which lies immediately northeastward of the anchorage.

Falsterbo Point, the southwest point of Skanör Peninsula, and the eastern entrance point of the Sound from the Baltic, may be recognized from its town, lighthouse, and church, the latter, however, obscured by trees in some directions.

The shore bank, which is about ½ mile off the west side of Knösen, gradually approaches that side of the peninsula to the southward, and at Falsterbo Point is only about 200 yards distant from it, while the 3-fathom contour line, which has also neared the coast, is about ¼ mile off.

Shoal.—Eusten, a shoal with 3¼ fathoms over it, lies 2 miles westward of the point. It is marked on its western side by a red spar buoy with 3 down-turned brooms.

A shoal, with a depth of 3 fathoms over it, lies about 1,400 yards westward of Falsterbo Point.

Light.—Near the extreme of Falsterbo Point is a tower 82 feet in height, the lower part of which is square-shaped, and upper part cylindrical; it is painted a yellowish gray with a black band, and exhibits, at an elevation of 78 feet above sea level, an occulting white light, visible 14 miles.

Ice signals.—Signals respecting the presence of ice in certain localities and regarding the withdrawal of light vessels, are made at Falsterbo Point. (See Chapter I.)

Beacon.—A brown pole beacon, 28 feet high, and with a circular top mark, stands eastward of Falsterbo Point.

Falsterbo Reef, consisting of sand and gravel and a few rocks, within the 3-fathom contour line, extends for a distance of nearly 4 miles southward of Falsterbo Point, with a width of about 2 miles at its southern end. About 1¼ miles from the point is Måkläppen, a dry sandy islet, and 1½ miles farther south is a patch, with rocks, on which the depths are less than 1 fathom; other patches exist between it and Måkläppen.

The 5-fathom contour line, which is about 1½ miles westward of the northern part of Falsterbo Reef, from that trends southwestward, and is nearly 3½ miles westward of the southwest end of the reef, from which it turns eastward in an irregular line, and is about 1 mile off the south end of the reef.

Hilda Ground, a shoal with 1¾ fathoms water over it, lies ½ mile southward of Falsterbo Reef, and ⅜ mile northwest of it is a shoal patch with 2¼ fathoms over it outside the 3-fathom contour line. Lycktraff, with 1½ fathoms over it, lies with Falsterbo Point Lighthouse bearing 28°, distant 2¾ miles. Vasterflaket, with 2¼ fathoms over its southern part, lies ½ mile south of Lycktraff.

Shoal.—A 3¾-fathom shoal, known as Sandflyttan, lies 4.3 miles, 222°, from Falsterbo Point Lighthouse and 1½ miles westward from the western edge of Falsterbo Reef.

Two shoals, of 4¼ and 4½ fathoms, are situated, respectively, 1,000 yards, 174°, and 1.2 miles, 191°, from Hilda Ground.

Lightvessel.—Falsterbo Reef Lightvessel, moored in a depth of

6 fathoms 1¼ miles southwest of Hilda Ground, has a red hull, a tower mast, a jigger mast, and "Falsterboref" painted on the sides; also a red ball at the masthead; it exhibits, at an elevation of 33 feet above sea level, a group flashing white light, visible 11 miles.

Fog signal.—A fog siren gives two blasts in quick succession every minute. If the siren is disabled, a bell is sounded.

Pilot signals.—The lightvessel being a pilot station for Flint and Drogden Channels, by day a blue and white flag and by night a fixed white light denote that pilots are on board. Otherwise they may be obtained from a pilot steamer stationed between Falsterbo and Drogden Lightvessels.

Lightvessel signal.—When Almagrundet Lightvessel is not in position a black cone, pointing upward, is hoisted at the gaff of the jigger mast of Falsterbo Reef Lightvessel.

Buoys.—A red spar buoy, surmounted by a down-turned broom, is moored about 1.2 miles westward of Måkläppen and close to the western edge of Falsterbo Reef.

A red spar buoy, surmounted by two down-turned brooms, is moored 1,700 yards westward of the center of Vasterflaket.

Hilda Ground is marked off its southern side by a red spar buoy, surmounted by an upturned broom over a ball.

Wreck.—The wreck of a vessel, with masts above water, lies sunk in 10 fathoms about 3 miles 216° from the lightvessel.

Current.—Near Falsterbo Reef Lightvessel the current usually sets either to the eastward or westward, following the direction of the south coast of Sweden.

The description of the Swedish coast, eastward of Falsterbo Point, will be found in Baltic Point, Volume I.

Danish shore.—Kalleboer, the broad and almost dry opening between Zealand and Amager, is about 3⅔ miles in width at its entrance, between Store Holm, southward of Zealand and the southwest point of Amager, but 3 miles within this it narrows to little over 1 mile.

Sorte Channel, a narrow and somewhat winding passage through Kalleboer, communicates with the South Harbor of Copenhagen; from the southeast side of Zealand, near Frederiksholm tile works, and where Kalleboer narrows, a dam crosses in an east-southeast direction to the west coast of Amager, and where this passes Sorte Channel is a sluice or opening, with a basin southward of it.

Lightvessel.—Kalleboer Lightvessel, which is small, and carries a red ball at the mainmast head, is moored in a depth of 2 fathoms on the eastern side of the entrance to Sorte Channel, and exhibits, at elevations of 21 and 14 feet, a fixed white and fixed red light, respectively, which are placed vertically and visible 6 miles, but the vessel is only in position from September 1 to December 1.

Fog signal.—During thick or foggy weather, a hand foghorn gives a blast of five seconds duration every two minutes.

Depths.—The depths in Sorte Channel are from 1½ to 3 fathoms.

Light.—A fixed red light is shown from the southwest pierhead of Kalleboer Sluice; a fixed green light from the southeast and a fixed white light on the northeast side; the red and green lights are elevated 14 feet and shown from gray posts, the white light, shown from a windmill at an elevation of 20 feet, kept between the two first lights leads through the dredged channel.

Buoys.—The western side of Sorte Channel is marked by spar buoys surmounted by twigs, and the eastern side by the same, but with a cross as topmark.

Pilots live at Strandegaard Village, and will board vessels at the entrance to Sorte Channel on the usual signal being made.

Prohibited anchorage.—Foreign vessels of war are prohibited from passing to the northward of an imaginary line joining Aflands Point and Jæger Kro, on the Zealand coast, 5 miles westward of the entrance to Sorte Channel.

Directions.—Small vessels, with local knowledge or having a pilot, can use Sorte Channel, but the depths in it are lessened by a continuance of northwest winds, while those from southeast raise the level considerably, causing a variation in the depths, which are somewhat equalized by the dam.

Kjöge Bay, about 13 miles in width, between Avedore Holme and Kjöge Sönakke and receding about 7 miles westward from a line joining these points, has general depths of from 5½ to 6 fathoms, and the 5-fathom contour line, sweeping around it, is 5 miles southward of its north side, 2½ miles from the west, and from 1 to 2 miles from its south side; some dangers lie within this, and outside it is Juels Ground.

From Avedore Holme, a small flat islet, around to Kjöge Sönakke, it is low, but abreast of Kalfslunde is Mosede Cliff of yellow color, and the land about Maglehöj is somewhat high. It is without trees to the northward of Kjöge Town, but to the southward of Billesborg and Pram Woods; toward Kjöge Sönakke the coast again becomes bare, except that Magleby Wood lies near that part.

The most conspicuous objects are Kagstrup and Höjelse Churches, the former white and the latter yellow; Kjöge Church, situated in the town; a building at Billesborg Point, light colored, with a red roof; Herfölge Church, which is nearly 2 miles west-southwest of Billesborg, and 3 miles east-southeast of it Vallö Church, with a red tower.

About 4 miles from Vallö Church, in the same direction, is Magleby Church, with a high spire.

Avedore.—Rifle practice takes place from a range at Avedore on week days during June, July, and August, from 6 to 11 a. m. and from 2 to 7 p. m.; also on certain days during March and September, from 8 a. m. to 4 p. m.

When firing is in progress a ball will be hoisted on a mast at the northwest end of the range, and vessels must not then approach Avedoer Holme within 2¼ miles.

Depths offshore.—The 3-fathom contour line, which passes about 1¼ miles southwestward of Kalleboer Lightvessel, is about the same distance southward of Avedöre Holme, but about 1 mile from Mosede Cliff it approaches the shore to ⅔ mile, inclosing Mosede Rock, which has a depth of ¾ fathom over it and lies about 600 yards off the cliff of the same name.

About 3 miles southward of Mosede Cliff the 3-fathom contour line draws offshore, and for about 2 miles is about that distance off it; this part of the bank is known as Kjöge Flat and has depths of from 1½ to 2¾ fathoms over it. The same contour line is only about 200 yards outside Kjöge Breakwater Heads, and to Kjöge Sönakke it is from ½ to ¾ mile offshore.

Juels Ground, some patches with depths of from 3¼ to 3¾ fathoms over them, is situated 3 miles eastward of Kjöge.

Clearing marks.—Herfölge Mill, in line with Billesborg, bearing 246°, leads northward.

Herfölge Mill, in line with the north side of Pram Wood, bearing 257°, leads southward.

Gjorslev Castle, in line with Kjöge Sönakke, 169°, leads eastward.

Magleby Church opens westward of Magleby Wood, 167°, leads westward.

Ice.—Average ice conditions, see Appendix IV.

Kjöge.—Kjöge Harbor, at the mouth of Kjöge River, is formed by two short breakwaters, each about 300 feet in length, in an easterly direction, the entrance between them being 16 feet in width. The railway runs on to the north quay of the harbor.

The depths in the entrance, and in the outer part of the harbor are 16¾ feet, but winds between north and east raise the water about 5 feet, while westerly winds lower it about 3 feet.

Light.—From a pole, 30 feet in height, situated on the north breakwater head, a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 28 feet above high water, and in clear weather the white light is visible 10 miles, the red light 8 miles, and the green light 6 miles. The light is shown all the year round except when the harbor is blocked by ice. For sectors, see Light List.

Beacon.—A white beacon stands on the south breakwater head.

Pilots may be obtained.

Town.—Kjöge is a town of 7,600 inhabitants, and here the Danes gained a great naval victory, under Niels Juels, over the Swedes, in 1677.

Communication.—Kjöge has railway communication with Copenhagen via Roskilde and with Rödvig and Faxe Bay; there is also a line to Næstved which joins the west coast railway of Zealand. The post and telegraph offices are near the harbor.

Coal and supplies.—Some coal and fresh provisions may be procured, and water from the quays, where it is laid on from the waterworks.

Repairs.—Small repairs to hull and machinery might be effected.

Kjöge Sönakke.—From Kjöge the coast trends in an east-southeast direction for 7 miles to Kjöge Sönakke, the conspicuous objects being Vallö Church, Magleby Wood and Church.

About 1 mile northward of Kjöge Sönakke is a shoal, with a depth of 2¾ fathoms over it.

Gunnery practice takes place during the latter part of September in the vicinity of Kjöge Sönakke, and while it is being carried out red flags are placed both on shore and on buoys off that part of the coast; vessels should not attempt to pass within the line of these buoys.

Coast.—From Kjöge Sönakke the coast trends southeast for 4 miles, and then south for about the same distance to Cape Stevns.

Chalk cliffs commence a short distance southeastward of Kjöge Sönakke, and at Kulsti Rende these have a deep fissure; at Mande Head, 1 mile farther south, the chalk cliff is 97 feet high.

The conspicuous objects are Gjorslev, Holtug, and Store Hedinge Churches, and Cape Stevns Lighthouse, but the three former will not be seen if close under the land.

Depths offshore.—The 5-fathom and 3-fathom contour lines are, respectively, about 1½ miles off Kjöge Sönakke, but gradually approach the shore to the southward, and the former is only about ¼ mile off Cape Stevns.

About ¾ mile and 1 mile eastward of Kjöge Sönakke are patches of 3 fathoms, and 2 miles farther south a shoal, with a depth of 2¾ fathoms over it, lies more than ½ mile off the coast.

Kalk Ground, a rock with depths of less than 1 fathom, is situated about ⅓ mile off the coast abreast of Kulsti Rende.

Buoy.—A conical red buoy, surmounted by one upturned broom, is moored in a depth of 6½ fathoms on the eastern side of Kalk Ground.

Sigerslev Pier, ½ mile south-southwest of Mande Head, extends in an east-southeast direction and has a depth of 3¼ fathoms at its

outer end, but easterly winds raise the water, and those from the westward lower it.

Shoals, with depths of 2 and 2¼ fathoms, lie off the pierhead.

Communication.—The railway, post, and telegraph are at Store Hedinge.

Supplies.—Fresh provisions and water can be obtained.

Cape Stevns, a chalk cliff 131 feet high, is the extremity of the promontory separating Kiöge and Faxe Bays, and is also the western entrance point to the Sound from the southward.

Light.—A circular white tower, 87 feet in height, standing near the extreme of Cape Stevns exhibits, at an elevation of 209 feet above high water, a flashing white light visible 21 miles.

Fog signal.—During thick or foggy weather a fog siren gives blasts of two seconds duration every 30 seconds.

Life-saving station.—A rocket apparatus is maintained near Cape Stevns.

Buoy.—A wreck, with least depth of 3¾ fathoms over it, lies 1.2 miles southward of Cape Stevns Lighthouse. It is marked by a wreck-marking lightbuoy about 150 yards southeastward from the wreck.

Southern approach to the sound—Directions.—Coming from the southwestward and being abreast of Cape Möens, a course should be shaped to pass well to the eastward of Cape Stevns, and as it is neared Höjrup Church, which is a conspicuous object, should be seen, but if the weather is thick the water should not be shoaled to less than 11 fathoms, the 10-fathom contour line passing about 3 miles eastward of Gyldenlöves Flat.

From the eastward, Trelleborg town and church, Falsterbo Lighthouse and lightvessel, and Falsterbo and Skanör Churches are all marks, and in thick weather it would be prudent to keep southward of the 10-fathom contour line, which passes 1 mile southward of Blenheim Shoal.

Anchorage.—Good temporary anchorage, with easterly winds, may be obtained in depths of from 4 to 5¼ fathoms, over sand and clay, westward of Falsterbo and Skanör.

Faxe Bay, between Cape Stevns and Möen, is about 15 miles in breadth at its entrance, receding about 13 miles. From Cape Stevns the north shore of the bay trends in a west-southwest direction, for 13 miles, to Strandegaarde, where Fedet Peninsula extends 3 miles to the southward, forming the east side of Præsto Fiord; the north coast is wooded in parts, and the peninsula is low.

Jungs Head on the south side of Præsto Fiord is low and wooded near the coast, Roneklint on the southern side of the entrance to Præsto Fiord is a low cliff. The north coast of Möen is low, except

at Nordfeld, about mid-distance of its north side, where the land is somewhat higher and is cliffy; between Borre Sö and Hellehavn Nakke it is also cliffy.

On the north shore, besides Höjrup Church, already mentioned, are several other conspicuous churches; Lille Hedinge Church being situated about 1 mile northward of Rödvig, which is 3 miles from Cape Stevns.

Havnelev Church northwestward, Höjstrup mansion house southwestward, and Faxe Church, which stands on high ground 8 miles westward, of Rödvig, the houses at Faxehavn, with Hylleholt Church, Strandegaard, at the northeast corner of Præsto Fiord, and Præsto Church on its southwest side are all conspicuous marks.

On the south side of the bay are Hegnede Tile Works, with two chimneys; Stege Church on the northwest side of the middle of Möen; and the chimneys of Stege sugar factories; Klosterskov Gaard, about 1 mile westward of Nordfeld, and about 1 mile within the north coast of Möen, Elmelunde, Borre, and Magleby Churches.

Depths offshore.—The coast continues to be nearly steep-to from Cape Stevns to Bæsdal, a distance of 3 miles, the 5-fathom contour line passing 1 mile outside the bay, at the head of which is Rödvig, has a westerly direction, for about 8 miles, to the entrance to Præsto Fiord, passing from 1 mile to 2 miles off-shore.

From the southern side of the entrance to Præsto Fiord the 5-fathom contour line, which trends in a southeast direction, is 5 miles off the northeast coast of Jung's Head and incloses Hollænder Ground and the shoals which encumber the entrance to Böge Ström, the channel between Möen and Zealand.

The 5-fathom contour line then forms a tongue to the northward, inclosing Gyldenlöves Flat and afterwards approaches the north coast of Möen closely, at 3 miles eastward of Nordfeld, Hellehavns Nakke being comparatively steep-to.

The 10-fathom contour line, from Cape Stevns, strikes straight across the entrance of Faxe Bay to Hellehavns Nakke, and in the space between these contour lines, the general depths are from 5 to 9 fathoms.

Rödvig Harbor, 4 miles southwestward of Cape Stevns, is about 100 yards square, between two moles, each about 400 feet in length in a southwest direction, the entrance, facing southwest, between their heads being 120 feet in breadth.

The general depths in the harbor are from 1 fathom to 1¾ fathoms, but gales from between northeast and east raise the water 4 feet, and those between west and northwest lower it the same amount. Alongside the eastern mole and breakwater there is a depth of 13 feet.

A warping buoy lies off the entrance, from between the months of March and November, and with on-shore winds the harbor is rough.

Light.—On the eastern mole head a hexagonal white and red tower, 13 feet in height, exhibits, at an elevation of 20 feet above the level of the sea, a fixed red light.

Dangers.—A rock with a depth of 2½ fathoms over it and 4 fathoms close-to lies from 600 to 800 yards south-southeast of the harbor.

Felskov Reef, with large rocks on it and steep-to, extends for ⅓ of a mile, in a southeast direction, from the point near Höjstrup village.

Pilots for most of the ports in the vicinity may be obtained.

Directions.—Lille Hedinge Church, in line with the east side of the storehouse at Rödvig, bearing about 14°, leads eastward of Felskov Reef, in a depth of 3½ fathoms.

Faxe church in line with a gap at the north end of Strand Skov, near Vemmetofte, about 283°, leads southward, but the latter object is not charted.

Communication.—There is railway communication with Copenhagen, the railway coming down on the eastern mole, and the station being near the harbor, as also are the post, telegraph, and telephone offices. A telegraph cable connects Rödvig with Libau.

Supplies of fresh provisions and good water can be obtained near the harbor.

Coast.—From the point at Höjstrup village the coast trends in a westerly direction, for 6 miles, to Faxehavn. The shore bank to the 3-fathoms contour line extends about 1 mile off this coast, and has on it several large rocks. At Vemmetofte, 4 miles westward of Höjstrup, is a small pier, with a depth of 3 feet at its end.

Faxehavn is a small harbor formed by an eastern breakwater, about 550 feet in length, in a southerly direction, and a breakwater extending from the shore westward of it in a southeast direction, and curving to the eastward, its total length being about 850 feet, with an entrance, facing south, between the heads about 60 feet in width. The position of the harbor may be known by Hylleholt Church.

The depths in the entrance and harbor are 1¾ fathoms, but easterly gales raise the water about 4 feet, and those from northwest lower it about the same amount.

Eastward of the preceding harbor is a breakwater, about 750 feet in length, in a southerly direction, which has a small harbor at its extreme, and between this and the western harbor is a considerable space, which might form a larger harbor, but both the latter are silted up.

Light.—On the eastern pierhead of the western harbor is a hexagonal white tower, 26 feet in height, with a red band, which exhibits, at an elevation of 33 feet above sea level, a flashing light, with white, red, and green sectors. (See Light List.)

Pilots may be obtained for this harbor and for Præsto Fiord.

Beacons.—Two white leading beacons are situated in the harbor, and when in line they lead to it.

Anchorage.—There is anchorage in a depth of 3 fathoms, over sand, about 600 yards off the harbor.

Communication.—A railway runs to Rödvig, and to Copenhagen via Kjöge, the station being close to the harbor as also are the post, telegraph, and telephone offices.

Coal and supplies.—A small quantity of coal is stocked, and some fresh provisions may be obtained, and water from a water cart.

Coast.—From Faxehavn the coast has a south-southwest direction for a distance of 5 miles, to the south extreme of Fedet Peninsula, which forms the eastern side of Præsto Fiord; the shore bank, to the 3-fathom contour line, which is about 1 mile from Faxehavn, gradually closes the coast to about ½ mile.

Præsto Fiord, entered by a channel about 2 miles south-southwest of Faxehavn, is about 3 miles in length, in a north and south direction, and 2 miles wide; the shore bank extends generally from ½ mile to ¾ mile from its shores, but in the center of the fiord is a basin with depths of from 2¼ to 2¾ fathoms.

Dangers.—Nordmands Flat, the northwest end of the extensive flat which fills the western side of Faxe Bay is the eastern side of the channel to Præsto Fiord, and has a depth of 1¼ fathoms over it; its northern and western sides break down steeply to 6 and 7 fathoms.

Buoy.—A white can buoy, surmounted by one down-turned broom, is moored in a depth of 7 fathoms, northwest of Normands Flat.

Middel Ground, a detached shoal which occupies the middle of the channel to Præsto Fiord, is 1,200 yards in length in an east-northeast and opposite direction, and 400 yards in breadth; it has a least depth of 2¼ fathoms, over sand, weed, and some rocks, and another patch, with nearly a similar depth, lies southward of it.

Fed Shoal, a sand spit, nearly awash, extends ½ mile in an easterly direction from the southeast side of Fedet Peninsula, and is on the western side of the channel. The eastern side of Fed Shoal is marked by a red spar buoy, surmounted by an upturned broom.

Stenrösen stretches out 1⅓ miles, in a northeast direction, from Roneklint, with depths of from 3 to 5 feet, and between it and Fed Shoal is Hesteskoen, with 3 feet of water over it, and channels on either side of it into the fiord; the dredged channel passing northward of Maderne, has a depth of 12 feet. The northern side of

Stenrösen is marked by two white spar buoys, each surmounted by straw wisps.

Lights.—The following lights are exhibited in Præsto Fiord and its approach:

Fedet Peninsula.—On the north end of the peninsula a fixed white rear light is exhibited, at an elevation of 33 feet above sea level from a post, 26 feet in height, and is visible 11 miles.

North Front Light is fixed green, and exhibited, at an elevation of 17 feet above sea level, from the gable of a brown building, 16 feet in height; it is visible 9 miles.

South Front Light, fixed red, is exhibited from a post 16 feet in height, at an elevation of 17 feet above sea level, and is visible 9 miles. The rear light in line with the North Front Light shows the north side, and in line with the South Front Light the south side of channel.

Roneklint Rear Light, exhibited from a post 33 feet in height, at an elevation of 39 feet above sea level, is fixed white, visible 11 miles.

West Front Light, fixed green, is shown from the gable of a brown building, 14 feet in height, at an elevation of 16 feet above sea level; it is visible 9 miles.

East Front Light, fixed red, is exhibited at an elevation of 16 feet above sea level, from a post, 15 feet in height, and is visible 9 miles. The rear light in line with the West Front Light shows the west side, and in line with the East Front Light, the east side of the channel.

Præsto Harbor, westward of Næbet, and on the south side of the fiord, consists of two moles, which extend for about 160 feet in a northwest direction, and a short arm from the western one, between which and the eastern mole is an entrance, facing northwest, about 100 feet in width.

The depth in the dredged channel entrance and harbor is 13 feet, but winds between north and east may raise the water 5 feet, and those from the westward lower it 3 feet.

Outside the harbor are five warping buoys.

Light.—From the gable of a yellow building 13 feet in height, situated on Nabet, ½ mile eastward of Præsto Town, a fixed light, with red and green sectors, is exhibited, at an elevation of 26 feet above sea level: the red light is visible 10 miles, and the green light 8 miles.

For sectors of the above lights, see Light List.

Beacons.—On the southeast side of Fedet are two black beacons, surmounted by triangles, which, in line, lead through the dredged channel southward of Hesteskoen.

Buoyage.—The dredged channel to Præsto is marked on its north side by perches surmounted by brooms, and on the south side by perches with straw wisps.

Tug.—The services of a tug might possibly be obtained.

Pilots may either be procured at Næbet or at Faxe.

Anchorages.—Off Strandegaard there is anchorage in depths of from 5 to 6 fathoms, over clay and sand, with the highest part of Blaabjerg in line with Skibbinge Church, bearing 222°, and Orup Mill in line with the north end of Skovshoved Lund.

Or in a similar depth southward of Middel Ground, with Roholte Church in line with Skovhoved Lund.

Between Stenrösen and Fed Shoal there is anchorage in 2½ fathoms, both these anchorages having good holding ground.

Directions.—Vessels proceeding to any of the ports in Faxe Bay can pass about ½ mile eastward of Cape Stevns, in depths of from 7 to 8 fathoms, and if bound to the western part should attend to the mark for leading southward of Felskov Reef, as given above.

The south side of the highest part of Blaabjerg in line with Skibbinge Church, bearing 221°, leads northwest of Nordmands Flat and to the anchorage off Strandegaard, but those intending to enter Præsto Fiord should take a pilot.

With Roholte Church open westward of Strandegaard, the breadth of the latter, the vessel is west of Nordmands Flat, and may steer for Roneklint to the entrance to the dredged channel.

Town.—The town of Præsto has about 1,500 inhabitants.

Communication.—A railway runs to Næstved, where it joins the line between Kjöge, to the north, and Masnedö, to the south; the lines run down to the quay. A post and telegraph office is situated near the harbor.

Supplies of fresh provisions may be procured, and water obtained near the harbor.

Böge Ström, the passage eastward of Jungs Head and the islands northwestward of Möen, is narrow and sinuous and is one of the four channels which lead to Smaalands Farvandet; it is entered about 3 miles eastward of Jungs Head.

Offshore dangers.—Nordmands Flat, the northwest end of the shallow bank which fronts the opening between Jungs Head and Nyord and Ulvshale, the islands northwest of Möen, has been described, and from it the 3-fathom edge of the bank trends in a southeast direction for nearly 10 miles; on its southeast end is Hollænder Ground, about 1,200 yards in length in a northeast and opposite direction, with a least depth of 5 feet over it.

Buoy.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 3 fathoms ½ mile northeastward of the depth of 5 feet.

Söhunde Bay, a bay about 3 miles in width, is situated southward of Hollænder Ground, and between it and Möen; it has depths of from 4 to 6 fathoms, and a shoal with 3½ fathoms lies in its center.

Gyldenlöves Flat, two shoals lying 3 miles eastward of Hollænder Ground, has a least depth of 17½ feet, over coarse sand and broken pebbles, on the southeastern patch, surrounded by depths of 5 fathoms.

Northwest side.—Southward of Roneklint, Jungs Head Peninsula, on the northwest side of Böge Ström, is about 3 miles in width, and southward of it the coast trends in a southerly direction for about 5 miles, the most conspicuous objects being Stavreby white church, with the usual shaped tower, and Ravne and Lunde Mills, both lying fairly high.

Lights.—Böge Ström leading lights, situated about 1 mile southwest of Jungs Head, are about 800 yards apart and in line, bearing 239°.

The rear light, fixed white, is exhibited at an elevation of 45 feet above sea level from a white wooden beacon 43 feet in height.

The front lights, consisting of red and green fixed lights placed on the north and south gables of a brown wooden house 16 feet in height, are shown at elevations of 16 feet above sea level; the white light is visible 11 miles and the red and green lights 9 miles. The lights show 5° on either side of the line of bearing.

Stenhage, with depths of from 3 to 9 feet, is a shoal extending in a northeast direction, for a distance of about 2 miles from Jungs Head; it forms the northwest side of Böge Ström.

Light.—On Stenhage an iron pole 10 feet in height stands, in a depth of 9 feet, about 2 miles eastward of Jungs Head, and exhibits, at an elevation of 7 feet above sea level, an unwatched occulting light, having red and green sectors, visible 3 miles. (For sectors, see Light List.)

Southeast side.—The southeast side of Böge Ström is formed by Sandhage, a shoal about 1 mile in extent, with depths of from 4 to 6 feet water over it. Sælö Shoals, southwestward of Sandhage, are on the southeast side of the continuation of the same channel.

Light.—On Sandhage, an iron pole 10 feet in height, in 7 feet water, and situated 4 miles northeast of Stavreby Church, exhibits, at an elevation of 7 feet above sea level, an unwatched occulting light with red and green sectors, visible 3 miles. (For sectors, see Light List.)

Bellbuoy.—A fairway bellbuoy, painted red and white in bands, and surmounted by a ball, is moored in 3¼ fathoms water 1 mile northeastward of the entrance to Böge Ström. During winter it is replaced by a conical buoy, similarly painted.

Entrance.—The channel from the fairway buoy to the northwest point of Sandhage, is from 310 to 360 feet in breadth, and the former width is continued to the southeast end of Stenhage, but at Bögenakke it is contracted to 150 feet.

Depths.—The depths in the outer part of the dredged channel are from 8¼ to 9 feet; in the middle part, and in the channel near Bögenakke, 9 feet. The deepest draft that can use this channel is 8 feet.

Easterly winds raise the level of the water at first, and if continued with gales lower it. Westerly winds lower the level and afterwards raise it.

Buoyage.—Close southward of the line of the leading light structures, a spar buoy, striped red and white, is moored in 13 feet, and surmounted by a ball.

The outer buoy on the northwest side is red, and the northwest side of the channel is marked by three red spar buoys, and surmounted by an upturned broom.

The outer buoy on the southeast side is a white spar buoy, surmounted by two straw wisps, and the southeast side of the channel is marked by five white spar buoys, each surmounted by a straw wisp.

The shoals on either side, and the channel further in, are all buoyed in accordance with the Danish system. (See Chapter I.)

Pilots.—Nyord is a pilot station, and the pilot boat is usually anchored close inside the entrance to Præsto Fiord, south of Stenhage; the pilots take vessels as far as Langö Vrid, or to the eastward till clear of the sand banks.

Directions.—Faxe Church, in line with the storehouses at Faxehavn, bearing 334°, leads northward of the fairway buoy off Böge Ström, and if continued on, as a stern mark, leads over the bank in a depth of 9 feet into Söhunde Bay.

Vessels coming from the north can keep Lille Hedinge Church its height above the water, open eastward of Höjstrup Wood, 27°, which will lead to the fairway buoy.

To pass eastward of Hollænder Ground in not less than 4 fathoms, Stege Church should be kept in line with Klosterskov Gaard, bearing about 210°, which also leads in the same depth northwest of Gyldenlöves Flat; Kongsbjerg in line with Magleby Church, about 147°, leads in a depth of 9 feet eastward of Hollænder Ground.

A small wooded point, at the east end of Möen, just open eastward of Taleren, bearing 162°, leads eastward of Gyldenlöves Flat.

By night.—Böge Ström fixed white light midway between the fixed green and red lights, bearing 239°, leads through the dredged channel, the fixed white light in line with the fixed green light marking its northwest, and the fixed white light in line with the fixed red light marking its southeast limit.

Nyord, an island about 1½ miles in extent, lying on the south end of Ægholm Sand, and about 5 miles southward of the entrance to Böge Ström, is flat, without trees, and moderately high; four small islands lie immediately northward of Nyord, and toward the northern end of Ægholm Sand are several islets.

Nyord Harbor, on the southwest side of the island, is formed by two small breakwaters, each about 200 feet in length, in a southerly direction, with an entrance, facing south, about 25 feet in width; it has a depth of 6 feet in the entrance, and about 5 feet inside, but northeast winds raise, and those from the west lower, the water about 2 feet.

Light.—A fixed white lantern light is shown from the west breakwater on dark nights, when the local motor boat is expected.

Town.—The town is situated close to the harbor, and its low church, with a sharp spire, is conspicuous. The island has about 1,000 inhabitants.

Communication.—A motor boat plies daily to Stege, with which town there is telephonic connection; the nearest railway station is at Kallehave.

Möen—North coast.—From Borre Sö, a small inlet extending about 1½ miles to the southward to Borre, the coast eastward to Hellehavn Nakke rises, is wooded, and has bluffs on its seaward side; the shore bank only extends about ¼ mile off it.

Life-saving station.—At Aalebæk, about 1½ miles eastward of Borre Sö, is a life-saving station, with a rocket apparatus.

Submarine telegraph cable.—From the coast between Aalebæk and Hellehavn Nakke a telegraph cable crosses to Bornholm.

Light.—On the northeast extreme of Hellehavn Nakke, a red and white striped tower 24 feet in height exibits, at an elevation of 131 feet above sea level, a group flashing light, with white, red, and green sectors; white light is visible 16 miles, the red light 12 miles, and the green light 10 miles. The sector of green light covers Gyldenlöves Flat. (For sectors, see Light List.)

East coast.—The eastern portion of Möen rises gradually from inland to the east coast, where it forms Möens Cliff, steep and wooded, with white chalk cliffs, which may be seen from distances of 27 or 28 miles. From Liselund, where the cliffs commence, they rise to Dronningestolen, their highest part, and then lower again southward of it, ending near Möen southeast lighthouse.

Aborrebjerg and Kongsbjerg, 463 and 466 feet, respectively, are about 1 mile westward of the coast.

Light.—A square tower, 43 feet in height, and situated on the southeast point of Möen, exhibits, at an elevation of 82 feet above sea level, a group-flashing white light, visible 15 miles.

Lägge Point.—Two fixed white lights of small intensity are

located on Lägge Point in line 321°. Mariners are cautioned not to confuse these lights with Grön Sound Range Lights, which in line bear 324°.

Depths offshore.—The 5-fathom contour line is generally about ½ mile off this coast, the 10-fathom line sweeping around at a distance of about 1½ miles.

Dangers.—Danneskjold, lying about 600 yards off the coast abreast of Liselund, is ½ mile in length within a depth of 4 fathoms, and has a least depth of 1¼ fathoms; south-southeast of Danneskjold are shoals of 2¼ and 2¾ fathoms, about ½ mile offshore.

Dronningeskamlen, 800 yards in length and 200 yards in breadth, lies 800 yards off the coast, abreast of Dronningestolen, and has a least depth of 1¾ fathoms, with from 4 to 5 fathoms close-to.

Wrecks.—A wreck lies sunk about 10 miles east-southeastward of Möens Cliff. Wrecks lie sunk bearing and distant from lighthouse on southeastern point of Möen Island as follows: 92° 5.8 miles and 189° 6 miles. The latter is marked by a light buoy showing a flashing green light.

Anchorage.—With gales between northwest and west-southwest anchorage with good holding ground may be obtained under Möens Cliff southward of Dronningestolen.

Kriegers Cliff (Möen Bank), the western end of which is 11½ miles eastward of Möens Cliff, stretches for a distance of 10 miles eastward, with a greatest breadth of 5 miles; it has depths of from 8 to 9 fathoms, over a sandy bottom, but in portions of it are large stones or rocks.

Telegraph buoy.—A red and white checkered telegraph buoy is moored, in a depth of 25 fathoms, about 4 miles east-southeast of the east extrême of Kriegers Flat.

Directions.—To clear the shoal ground off Möens Cliff a vessel should not approach the shore within a distance of two-thirds of a mile, nor in a less depth than 8 fathoms, and vessels of deep draft should not approach the southeast point under 1 mile, nor in a less depth than 6 or 7 fathoms; small vessels may keep to the westward into Hjelm Bay when Stege Church is open southward of the cliffs westward of the southeast point, bearing 288°.

For the entrance to Grön Sound see Chapter XI.

CHAPTER VII.

THE GREAT BELT, WITH AGERSÖ SOUND AND OMÖ SOUND.

The Great Belt, or central passage from the Kattegat to the Baltic, and having on its eastern side Zealand and Laaland, and on the western side Fyen and Langeland, is bounded on the north by an imaginary line joining Revsnæs and Fyen Head, and on the south by a similar line from Kappel Church, on Laaland, to Gulstav Cliff, the south extreme of Langeland; it is about 62 miles in length by the track recommended for moderate-draft vessels.

Langelands Belt is the name given to the Great Belt eastward of Langeland when southward of a line joining Omö and Hov, and the westerly portion of the Great Belt is that part westward of Langeland to the southern boundary already given.

Where Sprogö Island divides the Great Belt into two channels, that between Halskov Rev and Sprogö Österrev, is known as Öster Renden, or the East Channel, and the passage between Sprogö Vesterrev and Knudshoved, as Vester Renden, or the West Channel.

Depths.—The Dybe Channel, a vein of deep water, varying in breadth from about 3½ miles between the 10-fathom contour lines or shoals of that depth, eastward of Risinge Head, to about ½ mile between the same lines eastward of Vengeance Shoal, and 200 yards least breadth, runs in a sinuous course through the Great Belt, so that with ordinary care the navigation presents no difficulties for vessels up to 30 feet draft, as without actually following the deepest lane of water a depth of 7 fathoms may be obtained in clear weather and during the daytime on certain direct courses, which will be given.

Night navigation, owing to the excellence and number of the lights, may almost be considered as easier than by day, and where necessary directions will be given.

During thick or foggy weather, it will, especially in a vessel of deep draft, be prudent to anchor. Although the vein of deep water already mentioned may assist a vessel, proceeding at the slowest speed, to feel the way by the lead, it would be attended by risk, and convenient depths for anchorage can usually be found.

Anchorage.—The anchorage is good in almost any part, but the nature of the bottom is no particular guide to position, as in some places the clay is so stiff that it does not adhere to the lead.

The bottom consists chiefly of clay, covered in places by a thin layer of somewhat fine sand, and here and there gravel, the layer becoming thicker as the coasts are approached, and near the land the bottom is generally a strip of clean white sand, which farther out becomes more closely speckled than within, until it gives place to seaweed, with some bare spots.

The only characteristics that might be regarded as a rule are that in the deeper channels and their vicinity the bottom is mostly oaze, while on the shoals and near the coasts it is usually sand.

Currents.—Owing to the variable nature of the currents in the Great Belt, no rule respecting direction, strength, or duration can be given, but it has been observed that a north-going set is present with winds from north-northeast, through east, to west-southwest, and one to the southward with winds between west and north-northeast; also that winds from northwest increase the velocity of the southerly current.

A current running in one direction rarely occupies the whole width of the Great Belt, but currents may be running in opposite directions, on its east and west sides, or they may set in the same direction on both sides, with a current of more or less breadth between, and setting in the opposite direction; the edges of these contrary currents are marked by tide rips, and are never stationary.

The main current generally follows the line of the deep water, but this direction may not be assumed at the commencement, but after the current is settled for some little time, and inequalities in the bottom, shoals, and undercurrents may all tend to divert the direction.

Over unequal bottom eddies are also met with, usually showing on that side of the shoal toward which the current sets, and they may thus serve as a warning, but they also occur where there is a sudden decrease in depth, from perhaps 15 to 10 fathoms; these eddies should not be taken for the tide rips already mentioned.

The strength of the currents also vary, being dependent on the depth and breadth of the channels through which they pass, and are weaker in broad passages or over shallow water, and attain considerable velocity where the channels narrow or become deep. They also run at considerable rates over, or past, shoals or reefs, and as the formation of the bottom influences the direction, it may cause them to set toward dangers. They have been known to attain a velocity of 3 knots in calm weather and with apparently settled conditions.

The southerly current attains its greatest velocity in West Channel, and the northerly current runs strongest in East Channel. With local knowledge the counter currents, which frequently run strongly near the shore, may be utilized.

Southerly current.—The south-going current from the northern end of the Great Belt is divided into two branches by Elephant

Ground, the western branch setting toward and along the Fyen coast and through West Channel, except a small portion which sets eastward close round the north side of Sprogö, uniting south of that island.

The branch from eastward of Elephant Shoal sets close to Musholm, and along the northwest side of Halskov through East Channel and along the west sides of Agersö and Omö.

The western branch, which follows the west side of West Channel, strikes across from Knuds Head to Vresen Puller, where it divides, a weak branch setting between Langeland and Fyen, at least as far as Turö, while the greater portion runs toward Broen, after which its direction is greatly influenced by the wind, and if it should be strong from the westward, reaching over to Vengeance Shoal.

Through Langelands Belt the current follows the line of deep water, but is continually split up into branches by the irregularities of the bottom.

Northerly current.—The north-going current, following the deep water of Langelands Belt, sets strongly toward Nebbe Revler, taking a northerly direction across Broen, the western portion passing close to Hov Sand and setting eastward of Vresen, and through West Channel. The current setting across Broen is deflected by strong winds from either eastward or westward.

The eastern branch, running between Agersö and Vengeance Shoal, is joined, northward of Egholm, by the current coming from Agersö Sound, and this, augmented by a stream from Gjelle Ground, passes through East Channel, the whole northerly current, from both sides of Sprogö, continuing its course to the northward on both sides of Elephant Ground.

A weak current from the westerly part of the Great Belt sets northward and unites with the stream passing through West Channel.

Pilots.—Slipshavn, to the westward of Knuds Head, is the principal pilot station in the Great Belt, and the pilots take vessels to Nyborg, and through the Great Belt to Fredericia, Frederikshavn, and Helsingör; southward to Svendborg Sound, Rudkjöbing, and round the south of Laaland to Dragör; east to Vordingborg, Guldborg, and Bandholm, and if necessary as far as Bornholm; and also along the west coast of Jutland, from the Skaw to Horn Reefs or Graa Deep Bar.

Compasses.—Few good leading marks being available when passing through the Great Belt, it becomes absolutely necessary to closely follow the track laid down, for a moderate draft vessel, or in one of deep draft, to obtain the deepest water available, and to pass dangers at the greatest distance consistent with safety, that the courses should be accurately steered, this being especially the case by

night, when passing through a channel on a single bearing of a light, so that before entering the Great Belt the compasses should be carefully corrected, and in passing through every opportunity taken to check any deviation that may remain.

Revsnæs Light.—On the extreme of Revsnæs, a square white tower, 50 feet in height, exhibits, at an elevation of 79 feet above sea level, a flashing white light, visible 14 miles. (See also Chapter IV.)

Signal station.—Revsnæs is a signal station connected with the telegraph system, and vessels can communicate by the International Code.

Submarine telegraph cable.—A cable connects Revsnæs with Ballen, in Samsö, and its direction is marked by two white telegraph posts, surmounted by triangles.

Revsnæs Puller—Light and whistlebuoy.—Revsnæs Puller, the outer danger, which has 1 fathom water over it, and is situated 1 mile west-northwest of Revsnæs, is marked on its western side by a white buoy, with "Revsnæs" on it; it is fitted with a whistle, exhibits a flashing white light every 15 seconds, showing flash 5 seconds, eclipse 10 seconds, and is moored in a depth of 6 fathoms. When withdrawn on account of ice a conical white buoy is substituted. (See Chapter IV.)

As Næs, the extreme of a peninsula nearly 6 miles in length, in a west-northwest direction, is 5 miles southward of Revsnæs, and forms the south side of Kallundborg Fiord. The peninsula is lower than Revsnæs, and is wooded in places; its extreme is surrounded by shoal water.

Light.—A flashing red light, visible 6 miles, is exhibited near the northwest end of As Næs, but it is only shown from August 15 to November 1.

As Næs Northwest Flat, consisting of clay and sand, with some rocks on it, with depths of from 1½ to 2½ fathoms, extends about 1.1 miles northwestward of As Næs.

As Næs Reef, with depths of from 1¼ to 2¾ fathoms, extends in a westerly direction for a distance of 1⅔ miles from the southwest side of As Næs; it has two channels, used by small craft, across it, and about 1,200 yards westward of its extreme is a shoal of 3 fathoms.

A patch of 3½ fathoms lies about 1,200 yards off its northwest side, and one of 3 fathoms close to its south side, and 1 mile and 1½ miles westward of its extreme are patches of 4 and 4½ fathoms, respectively, separated from it by a vein of deep water, in which there is a depth of 16 fathoms.

Buoy.—A white can buoy, surmounted by three down-turned brooms, is moored in a depth of 6 fathoms on the western edge of the 3-fathom patch westward of As Næs.

Kallundborg Fiord, between Revsnæs Peninsula and As Næs, is 3 miles wide at its entrance and extends about 4½ miles in an east-southeast direction to Kallundborg, where it is about 1 mile across; the general depths in the fiord are from 6 to 9 fathoms, over a bottom of clay and ooze, but inside Gisselöre Point it is weedy.

The north side of the fiord is high, hilly, consisting almost entirely of cultivated or grass land without woods, and at the north side of the entrance is Ulstrup Church, painted white, with a pointed red roof, and Ulstrup Mill close northwest of it, standing high, conspicuous, and well clear of Ulstrup village, apparently on a bare patch between two woods.

About 2 and 3½ miles, respectively, southeastward of Ulstrup are Norstrup and Raklev Mills, both on the northern slope of Revsnæs Ridge, but shut in on some bearings from the fiord; 2 miles farther, in the same direction, Raklev Church, painted white, with a tall square tower and pointed red roof, is also high and shut in on certain bearings, while near the shore to the westward of it is the Coast Hospital, painted yellow; Kallundborg Church, on the west side of the town, has four low, sharp spires around a central and higher one, and the tower, marked near Kaastrup, shows round and conical above the trees.

Havnemark village, consisting of five white cottages, is a good mark, and about midway of the length of the peninsula that forms the south side of the fiord; Mineslund farmhouse, standing between two woods, has several large buildings, a tall chimney, and a wind motor, which latter is conspicuous from all directions in the fiord; farther eastward are Hedevigslyst House and Lerchenborg Mansion, buildings, and park.

Eastward of Kallundborg is Tommerup Banke, with a tower, and southward of it Tommerup Church and mill, the former white, with a tall tower and pointed roofs.

Depths offshore.—The 5-fathom contour line, which is about 1,200 yards southward of Revsnæs, approaches the coast to about half that distance southward of Ulstrup, from which it skirts the remainder of the north coast at a distance of about ½ mile. Until nearly abreast of the Coast Hospital, the shore bank, to the 3-fathom contour line, is about 400 yards off, but from the hospital to Gisselöre Point it is about 800 yards from the shore, and known as Gisselöre Sand.

After As Næs Northwest Flat is passed the 5-fathom contour line is about 600 yards from the south shore till near the head of the fiord; the bank consists of stones, except in Havnemark Bay.

Buoys.—The edge of Gisselöre Sand is marked by six white spar buoys, surmounted by wisps of straw; they are moored in a depth of 2 fathoms.

Gisselöre Point.—The head of the fiord forms a small bay about 1 mile in extent, the east side being a narrow hook-shaped strip of lowland, the extreme of which is Gisselöre Point.

Light.—On Gisselöre Point is an octagonal-shaped red and white vertically striped tower, 26 feet in height, exhibiting, at an elevation of 29 feet above sea level, an occulting white light, visible 7 miles, but it is not lighted when the fiord is obstructed by ice.

Buoy.—A white spar buoy, surmounted by two straw wisps, is moored, in a depth of 6½ fathoms, ½ mile eastward of Gisselöre Lighthouse.

Piers.—There are piers at Ulstrup, at the Coast Hospital, and in Havnemark Bay; the hospital pier is 131 feet in length, and has a depth of 4½ feet at its outer end, but some rocks lie about 60 yards from the end and sides.

Anchorages.—Vessels can anchor all over the fiord, the holding ground being good, and large vessels can stand in until Kallundborg Church is in line with Gisselöre Point, bearing 344°, and anchor in the middle of the entrance in a depth of 6 fathoms; westerly and northwest winds send some swell into the fiord.

A good anchorage for a large vessel is with Tommerup Church and mill in line, bearing 87°, and Raklev Church about 29°.

Small vessels may anchor inside Gisselöre Point, but the bottom being weedy, a good scope of cable is required. With southerly winds there is good anchorage in Havnemark Bay.

Pilots board vessels immediately inside Gisselöre Point; they can take vessels to Korsör, Nyborg, Frederikshavn, Fredericia, and the Sound.

Directions.—Coming from the northward a vessel, after rounding Revsnæs, may steer into the fiord, with **Kallundborg Church,** bearing 108°, and will open of the south part of **Revsnæs Peninsula.**

From the southward Ulstrup Church should be in line with the eastern end of a whitish cliff near the beach, **bearing about 36°,** which will lead, in a depth of 4 fathoms, westward of As Næs Reef and Northwest Flat, and when Raklev Church is open north of the first house, northward of the Coast Hospital, bearing about 88°, that mark will lead northward of As Næs Northwest Flat, in a depth of 5 fathoms. Deep draft vessels should steer with the church bearing 44°.

By keeping Raklev Mill in line with the north end of the first house, northward of the hospital, bearing about 80°, a small vessel may pass over the extreme of Northwest Flat, in a depth of 2 fathoms, and when Northwest Flat is passed, vessels should steer for Gisselöre Lighthouse, passing southward of the buoys marking Gisselöre Sand.

Ice.—Average ice conditions, see Appendix.

Kallundborg Harbor is formed by a detached breakwater extending in a southerly direction for a distance of about 330 feet, and then turning in an east-southeast direction for about 1,600 feet, with an opening midway.

An entrance between the western end of the detached breakwater and a short arm extending from this shore is about 60 feet in width, and between the eastern end of the same breakwater and another short arm is an eastern entrance, about 150 feet in width.

Lights.—A fixed green light is shown from a green post 15 feet above high water on the mole head on the north side of the eastern entrance. On the western corner of the quay is shown a fixed red light. The following light is shown when vessels are expected: On east end of breakwater, a fixed white light (Oct. 1 to Apr. 1).

Depths.—The harbor is approached through a dredged channel, in which are depths of 3¾ fathoms, and there is the same depth in a vein of water toward the north quay; the depth in the western entrance is only about 4 feet. Gales from the northwest raise the level of the water about 4 feet, and those from southeast lower it 3 feet.

There are three warping buoys on the east side of the dredged channel.

Anchorage in the dredged channel is forbidden.

Town.—The town of Kallundborg has a population of about 4,500.

Communication.—There is communication by steam vessels with Aarhus, Samsö, and Sejrö, and a railway to Copenhagen and to Næstved, the station being near the harbor, as are also the post and telegraph offices.

Coal and supplies.—About 14,000 tons of coal are kept in stock; fresh provisions may be procured, and water is laid on to the quay.

Time signal.—A time signal is given daily at the telegraph office at 1h. 0m. 0s. p. m. mid-European time. See Chapter I.

Jammerland Bay.—From As Næs the coast has first an east-southeast direction, then turns to the southward and curves around to the southwestward, forming Jammerland Bay, which is nearly 10 miles across between As Næs and Reersö, and recedes 4½ miles from a line joining those points.

On the northeast side of the bay are Aarby and Rorby Churches, about 2½ miles southward of Kallundborg, and 2 miles southeast of the latter church are Udby and Svallerup Churches. Ur höj, 164 feet high, is nearly 2 miles south by west of Svallerup Church, and about 2¾ miles from the southeast side of the bay is Helsinge Church.

Reersö, a peninsula connected to Zealand by a low, narrow isthmus, has a steep cliff, 62 feet high, on its west side. The shore bank surrounding Reersö extends for about 1,200 yards.

Light.—A fixed white fishing light is exhibited, at an elevation of 44 feet above sea level, from a lamp-post 16 feet in height and situated on the southwest point of Reersö. It is shown from the 16th of August to the 16th of October.

Depths offshore.—The 5-fathom contour line, passing about ⅛ mile southward of As Næs, rapidly increases its distance from the shore, and is about 1 mile from the northeast side of the bay, and 2½ miles from the east side, where it incloses Svallerup Bank; along the northwest side of Reersö it is about 1½ miles offshore.

The general depths in the bay are from 6 to 8 fathoms, but there are some patches of from 4 to 4¾ fathoms.

Svallerup Bank, on the western edge of which is Ur Sten, a rock with 1¼ fathoms water over it, is 1½ miles from the coast, and is about 1 mile in extent, with general depths of from 2 to 2¾ fathoms. A channel in which there is 4¾ fathoms water separates it from the shore bank.

The shore bank southward of Svallerup Bank is about 1 mile offshore, and on the western side of Reersö is a large rock, which dries 1 foot, and has a channel with a depth of 8 feet between it and the shore.

Lyse Ground, of sand and stones, consists of three patches, which front Jammerland Bay, occupying a space of about 7½ miles, in a northwest and southwest direction; on the northwest patch is a least depth of 2¾ fathoms, on the middle patch 3¼ fathoms, and on the southeast patch 2¾ fathoms. The shoalest part of the northwest patch is about 2½ miles eastward of the track recommended for vessels, shown by a pecked line on the chart.

Clearing mark.—There are no good clearing marks, but As Næs, kept one-third of the distance between Ulstrup and Raklev Churches, bearing about 38°, leads northwest of Lyse Ground.

Elephant Ground, lying nearly midway between Reersö and Romsö, is about 1 mile in length, in a northwest and opposite direction within the 5-fathom contour line, in the least water, 1½ fathoms, being near its southern part, and between it and Lyse Ground is a channel with from 12 to 20 fathoms water.

Buoy.—A white can buoy, surmounted by two downturned brooms, is moored in a depth of 6½ fathoms ½ mile westward of Elephant Ground.

Clearing marks.—No good mark can be given for clearing the shoal on its western side, but Viby Mill, in line with the north point of Romsö, bearing 250°, leads northward.

A vessel would also pass northward of it by keeping Dalby Banker, three conspicuous hills on Zealand, about 2 miles eastward of Reersö, in line with the largest and northernmost cliff on Reersö, about 106°.

The northernmost mill, near Kjerteminde, in line with Stavres Head, bearing 258°, or Dalby Banker, in line with the southernmost cliff of Reersö 94°, leads southward of Elephant Ground.

West side.—The west side of the northern entrance to the Great Belt is formed by the east coast of Hindsholm, which from Fyens Head trends in a south-southeast direction for 9½ miles.

The island is hilly, the hills on the northern part being bare, but with trees in places to the southward. About midway between Horse Cliff and Stavres Head is Bögebjerg, a trigonometrical station, on a partly wooded hill 115 feet high, and southward of it are Stubberup Church and Mill, the former white, and the latter sometimes known as Hersnab Mill.

Dalby and Viby Churches lie farther south, the latter having a sharp tower; Viby Mill is westward of the church, but the three last are low lying and only seen from one direction.

Depths offshore.—Lille Ground and the shoals northward of Fyens Head have been described in Chapter IV, and from Horse Cliff, a small hill 25 feet high at the northeast end of Hindsholm, the shore bank to Stavres Head nowhere extends more than ½ mile from the coast, the 5-fathom contour line being from ¾ mile off at the northern part to ½ mile farther south, but abreast of Dalby it extends off 3 miles, surrounding Romsö.

Romsö, a small thickly wooded island, 120 feet high, is about 2½ miles northeast of Stavres Head; its eastern side is a steep cliff, about 20 feet high, on which is the lighthouse, and its southwest side terminates in a low narrow point of land.

Light.—On the east side of Romsö an octagonal-shaped yellow tower, 31 feet in height, exhibits, at an elevation of 55 feet above water, a group flashing white light, visible 13 miles. From the northeastward the lighthouse is partly hidden by trees.

Fog signal.—A siren gives one blast of about two seconds duration every minute; the siren is situated on the slope close southward of the lighthouse.

Dangers.—Ryggen, a collection of large stones, lying fully 4 miles eastward of Horse Cliff, is about 1,200 yards in length in a north and south direction, and about 600 yards in width within the 5-fathom contour line; it has a least depth of 3 fathoms, and is about 1½ miles westward of the track.

A shoal, with a depth of 3¾ fathoms, lies 2 miles south by west of Ryggen.

Kolby Church, showing its height above water, inside the western edge of Brattingsborg Wood (Samsö), bearing 328°, leads eastward.

Aarby Church, in line with the south side of Randemose Lund, 85°, leads 400 yards northward.

Raklev Church, inside the north edge of Vesterskov, on As næs, bearing 63°, leads southward.

Stubberup Knoll, with a depth of 3¾ fathoms over it, lies 2½ miles off the coast, and the same distance south of Ryggen.

Stubberup Knoll lies with Stubberup Mill and Church in line, bearing 220°, and the mill well open northwest or southeast of the church, leads northwest or southeast, respectively, of the shoal.

Romsö Tue, nearly 3 miles southeastward of Stubberup Knoll, is about 100 yards in extent, within the 5-fathom contour line, and has a least depth of 3¾ fathoms; it lies nearer the track than any of the dangers in this locality, being about 1.2 miles westward of it, and, as it is not buoyed, is dangerous for deep-draft vessels.

No mark is given for passing eastward of this shoal, but it is only 2½ miles north by east of Romsö Lighthouse, and a bearing of the latter should clear it.

Stubberup Mill, open north of Bögebjerg Wood, bearing 245°, leads northward, and the same mill open south of that wood, 274° leads southward of Romsö Tue.

Polyphem, with a depth of 3¼ fathoms, and situated 1¼ miles west by south of Romsö Tue, is about 200 yards in extent within the 5-fathom contour line. At 600 yards southward of the shoal is a depth of 5 fathoms.

The highest part of Romsö, bearing about 180°, with Nyborg Church shut in by it, leads eastward.

Stubberup Mill, in line with the south side of Bögebjerg Wood, bearing 250°, leads northward, and Stubberup Church in line with the same side of that wood, 264° leads 600 yards southward.

Torske Flat, a small patch of stony ground, with a depth of 3½ fathoms over it, lies 1,200 yards north by east of the north side of Romsö, and is within the 5-fathom contour line surrounding that island.

Stubberup Church in line with the south side of Bögebjerg Wood, bearing 264°, leads northward of Torske Flat.

Klæpen.—Torske Flat is the extreme of the dangers extending northward of Romsö, and from the western low point of that island Romsö West Reef stretches to the westward for a distance of about 1,600 yards, drying at low water, and terminating in Klæpen, where it is steep-to on its west side; from Klæpen a narrow spit with depths of from 2½ to 2¾ fathoms over it extends for nearly 1 mile in a north-northwest direction.

Buoy.—A white can buoy, surmounted by one down-turned broom, is moored in a depth of 3½ fathoms, close westward of Klæpen.

Romsö Puller, several rocky patches, with depths of from 1¼ to 2½ fathoms over them, lie off the southeast side of Romsö, the south-

eastern, with a depth of 2½ fathoms, being 1,800 yards southeastward of the lighthouse, and close to the 5-fathom contour line.

A conical red buoy surmounted by a red staff with two upturned brooms marks the southeastern shoal.

Rönnen, extending in a south-southwest direction for 1¼ miles, from the low west point of Romsö, has a rocky patch, with a depth of 1¼ fathoms on its west side.

A white can buoy surmounted by two down-turned brooms is moored in a depth of 3½ fathoms 100 yards southwest of the depth of 1¼ fathoms.

Stavres Head, the southeast extreme of Hindsholm, terminates in a cliff 31 feet high.

Pier.—About 1 mile northward of Stavres Head is a pier, 262 feet in length, with a depth of 1½ fathoms at its outer end.

Romsö Sound, the channel between Romsö and Hindsholm, is about 2 miles in length, its western side being the shore bank, extending from Hindsholm for a distance of about ½ mile, and its eastern side Klæpen, with the shoal extending north-northwest of it and Rönnen.

Depths.—The depths in the sound are from 3¾ to 8 fathoms, but a patch of 3 fathoms lies nearly in mid-channel of the southern entrance.

Directions.—Coming from the northward, Nyborg Church, in line with Stavres Head, bearing 172°, leads to the northern entrance, and a small house near the beach at Snave, nearly open of Bögebjerg Cliff, bearing 326°, used as a stern mark, leads through the Sound, passing 100 yards westward of Rönnen Buoy, but the channel is narrowed by the 3-fathom patch above mentioned, and it should not be attempted by vessels drawing more than 16 feet water.

Anchorage may be taken up either north or south of Romsö West Reef on the north side in a depth of 3 fathoms, with shelter from winds between east and southwest, with Klæpen a little inside Stavres Head, bearing about 190°. Southward of West Reef small vessels are sheltered from north-northwest, through north, to east-northeast in from 2 to 3 fathoms.

Directions—Schultzs Ground to Sprogö.—Directions for East Channel and West Channel are described later.

The track recommended to be followed by vessels of moderate draft, and shown on the chart by a pecked line, is as follows:

From about 1 mile southeast by east of Schultzs Lightvessel, a 210° course for about 13½ miles, or until Sejrö Lighthouse, on Gniben, bears 119°, leads to a position 1½ miles westward of Sejrö Northwest Reef light and whistle buoy, when the course should be altered to 221° for 9 miles, passing about ⅔ mile southeast of Hatter Barn Lightbuoy.

When Revsnæs Lighthouse bears 161°, the course is 188° for 11 miles, passing 1¼ miles westward of Revsnæs Reef light and whistle buoy, and when As Næs light structure, or its northwest point, bears 72° and Romsö Lighthouse 176° the course should be altered to 153°, which passes nearly equidistant from Elephant Ground, on the east, and Ryggen and Romsö tue, on the west.

Approaching the Great Belt from the westward, after passing northward of Lille Ground Lightbuoy, Möllebanke Mill, in line with a break in Brattingsborg Wood (both on Samsö), bearing about 342°, used as a stern mark, will lead between Lille Ground and the shoals between it and Horse Cliff, on the west, and Ryggen and Stubberup Knoll, on the east.

Deep-draft vessels from near Schultzs Lightvessel should steer 210° to pass 1½ miles westward of Sejrö Northwest Reef light and whistle buoy, and when Sejrö Lighthouse bears about 125° alter course to 227°, with Hatter Barn Lightbuoy ahead, passing 1 mile southeast of Middel Flat and ⅝ mile northwest of a 4-fathom patch, 3 miles eastward of Hatter Barn.

Having passed eastward of Hatter Barn Lightbuoy steer for Ljus Hook Lighthouse, on the southeast point of Samsö, bearing 235°, until clear of the 5-fathom patch 3 miles southward of Hatter Barn, or when Revsnæs Light bears 160°, when steer about 180° to pass 2½ miles westward of Revsnæs, or 1¼ miles from Revsnæs Reef light and whistle buoy, and when past it alter to 188° till the northwest end of As Næs Peninsula bears 90° and Romsö Lighthouse 177°, when the lighthouse should be steered for on that bearing, which should lead between the 4½-fathom patch at the northwest end of Lyse Ground and Ryggen.

When Vestborg Lighthouse (Samsö) bears 316°, steer 136°, with it astern, until Stubberup Church bears 241°, when a 166° course may be shaped for Sprogö Lighthouse.

By night.—From eastward of Schultzs Ground Lightvessel steer about 210° to pass about 1½ miles westward of Sejrö Northwest Reef Light and Whistlebuoy, and when Sejrö Light bears 125° alter course to 227°, with Hatter Barn Light Buoy ahead, which should lead 1 mile southeast of Middel Flat and 1,400 yards north-northwest of the 4-fathom patch eastward of Hatter Barn.

Having passed this patch, steer to pass eastward of Hatter Barn Lightbuoy and bring Ljus Hook Light to bear 235°, steering for it on that bearing until past the 5-fathom patch nearly 3 miles south-southwest of Hatter Barn, and when Revsnæs Light bears about 160° alter course to pass 2½ miles westward of it.

From abreast of Revsnæs steer about 188° until Romsö Light bears about 177°, when alter course for it, which should lead midway between the 4½-fathom patch of Lyse Ground and Ryggen, and when

Vestborg Light bears 316° steer 136°, with it astern, until Romsö Light bears 200°, when alter course to 166° for Sprogö Light.

This course should lead 1 mile westward of Elephant Ground Buoy, but if Sprogö Light is not sighted it might be advisable to pass between Elephant Ground Buoy and Romsö Tue on a bearing of Romsö Light, altering course to the southward when past the former shoal.

When Halskov Light bears 134° follow the directions, continued later.

From the southward, and being 400 yards westward of Halskov Reef Light and Whistlebuoy, steer 357° until Sprogö Lighthouse bears about 229°, with Knuds Head open to the northward of it, and then alter course to 327°, and when Sprogö Lighthouse bears 165° steer 345°, with it astern, which should lead between Elephant Ground and Romsö Tue.

When Stubberup Church bears 241° steer 316° for Vestborg Lighthouse until the north extreme of As Næs bears 62°, when the course should be altered to about 2°, or to pass Revsnæs at a distance of 2½ miles, the lightbuoy being an additional guide.

Continue the 2° course, giving the 5-fathom patch south-southwest of Hatter Barn a good berth, and when Ljus Hook Lighthouse bears about 240° edge to the eastward until it bears 237°, when steer 57°, with it astern, which should lead 1 mile southeast of Hatter Barn Lightbuoy, altering course to 7° when Revsnæs Lighthouse is on the opposite bearing astern.

When Sejrö Lighthouse bears 77° keep to the eastward to pass 1 mile from Sejrö Northwest Reef Light and Whistlebuoy, and with Sejrö Lighthouse bearing about 128°, the course may be shaped for Schultzs Ground Lightvessel.

By night bearings of the lights may be substituted for the lighthouses.

Current.—Entering the Great Belt from the northward attention should be paid to the set of the current, as the northerly stream tends to set toward the shoals on the west side, and sometimes sets directly across the entrance toward Bolsax and Falske Bolsax.

East side—Reersö to Korsör.—The coast between Reersö and Korsör is generally devoid of trees, but northwest of Stillinge is a small plantation near the shore. The most conspicuous objects are Reersö Church, with a spire; Dalby mill, close eastward of Reersö; and Dalby Banker, the three hills already mentioned.

At Mullerup Harbor, on the east side of Musholm Bay, are brickworks and a number of buildings, the limekilns and granary being the highest and most conspicuous. Slagelse churches, about 5 miles

from the coast have pointed spires, and Stillinge church and mill lie 1½ miles inland, the former being painted red.

Slots Bjergby Church stands at an elevation of 312 feet; it is painted white, and in clear weather may be seen from a considerable distance to the northward. Vemmelev and Hemmershöj churches are southwest of Slots Bjerghy, and westward of them is Taarnborg Church, all being painted white, and of the usual shape of the country churches.

Depths offshore.—The shore bank, to the 3-fathoms contour line, surrounds Reersö at a distance of about ½ mile, and continues about that distance offshore till abreast of Stillinge, from which to a small bay in the southeast corner it is nearly 1¼ miles off.

Musholm, a small low island lying southward of Reersö, has yellow cliffs on its southwest side; it lies on a bank 3 miles in length and about 1 mile in width, within the 3-fathom contour line, the general depths on it being from 1¼ to 2¾ fathoms.

Slettings Ground.—The 5-fathom contour line, which surrounds Reersö, and the bank on which Musholm stands extends for a distance of nearly 4 miles southward of that island, and near its southern extremity is Slettings Ground, patches of from 2¼ to 3 fathoms, which extend north and south for a distance of 1⅜ miles.

It is separated from the flat extending southward of Musholm by a channel 300 yards in breadth, and with a depth of 3 fathoms, and on its south side is a narrow vein of deep water, in which is a depth of 4 fathoms, which extends into Musholm Bay.

Musholm Bay, between the bank on which Musholm lies and Slettings Ground, somewhat sheltering it on the west, and the west coast of Zealand on the east is about 2 miles in width, with depths of from 4¼ to 4¾ fathoms in the northern, and from 6 to 9 fathoms in the southern part, and affords good anchorage with all winds in the northern portion.

Mullerup Harbor, formed by two breakwaters, the northern of which is about 800 feet in a westerly direction, the outer part in the form of an inverted V, with the angle to the northward: the southern breakwater extends in a northwest direction for about 650 feet.

The depth in the harbor is about 10½ feet, but gales from northwest raise the water 3 feet, and those between southeast and south lower it the same amount.

Pilots may be obtained, but only for Musholm Bay and the harbor; a warping buoy lies off the latter.

Current.—The current sets across the harbor entrance.

Anchorage may be taken up anywhere in Musholm Bay, the holding ground being good; the best berth for small vessels is in a depth

of 2½ fathoms, in the bay eastward of Reersö, where the holding ground is so excellent that a southerly gale might be ridden out.

Directions.—There is a depth of 17½ feet in the channel between Reersö and Musholm, and Löve Mill, in line with the warehouse near Mullerup Harbor bearing 99°, leads through.

Town.—The town of Mullerup is about 1¼ miles from the harbor.

Communication.—There are railway stations at Höng or at Gjerlev, about 5 miles distant; the post office is at Slagelse, the telegraph at Mullerup, and a telephone at the harbor.

Halskov, the peninsula which forms the south side of Musholm Bight, stretches to the westward for about 5 miles, and is bare of trees; as the land lowers for some distance inland from the extreme the headland has an unmistakable appearance. Between it and Knuds Head, on Fyen, is the narrowest part of the Great Belt, as the passage is divided by Sprogö into two channels named East and West Channels.

The most conspicuous object on the north side is Höjbjerg, a sharp-pointed hill, 102 feet high, and the highest part of the peninsula, Halskov, terminates to the westward in two steep yellow cliffs, 53 feet high, the north part known as Höj Cliff and the south as Rev Cliff, both easily made out from the Belt.

Southward of Rev Cliff is a low point, extending in a south-southwest direction, within which is the railway station, and southeastward of this are Rebbes Cliff and Lygtebanken, two steep cliffs, the lighthouse being on the latter, but it is not conspicuous; farther southeastward is the town of Korsör, which is on both sides of the entrance to Korsör Nor, a tidal lake, about 2 miles in circumference, and with depths of about 10 feet. Korsör Castle, and the church, to the southward of it, are both square with pointed roofs, and painted red, and with the high-water tower form good marks.

The chimney shown to the northeastward of the leading light structures is not the highest in the vicinity.

Submarine telegraph cables.—Two cables across the belt to Knuds Head from northwestward of Halskov, passing northward of Sprogö; the direction is marked on Zealand by two large white telegraph poles.

Light.—A fixed white light is exhibited at an elevation of 51 feet above high water, from the gable of a yellow dwelling, 17 feet in height, and visible 12 miles.

During severe weather a light is sometimes shown on Halskov Point for the post boats.

Halskov Reef, extending nearly 1½ miles from Halskov Point in a westerly direction, is first a rocky reef, stretching 600 yards from the point, with less than 1 fathom water over it, outside which, and separated by depths of from 3¼ to 4¾ fathoms, is a flat, with rocky

patches on it, and depths of from 1½ to 1¾ fathoms; the outermost shoal, with 3½ fathoms water, is about 1½ miles from the point.

Vessels drawing 28 feet are reported to have touched on an obstruction about 100 yards 259° from Halskov Reef Light and Whistle Buoy.

Light and whistle buoy.—A white buoy, exhibiting a flashing white light, with a period of 15 seconds, and sounding a whistle, is moored in a depth of 11 fathoms about 200 yards southwestward of a 4-fathom shoal on the outer edge of the reef; it shows light 5 seconds, eclipse 10 seconds. Near the buoy are depths of 11 fathoms.

Buoy.—On the south side of Halskov Reef a white can buoy, surmounted by two down-turned brooms, is moored, in a depth of 4 fathoms, 1,470 yards south by west of Halskov Point.

Revkrog, a small bight in the shore bank eastward of Halskov Reef, is formed on the north by the land of that point, and on the southeast by a flat that extends from the entrance to Korsör Harbor; there is a depth of 3¼ fathoms in the bay, at 300 yards from the shore.

Kragepuller, two shoals, with depths of 1¼ and 2 fathoms, lie on the above flat, and 1,200 yards from the coast.

Lygtepulle, near Lygtebanken, extends 600 yards from the coast to a depth of 3¼ fathoms, and has a rocky reef, with a depth of 1¼ fathoms, at 200 yards from the shore.

Sengen, a vein of deeper water, extends eastward of Lygtepulle, and Lygtesand is a light-colored sandbank, extending from the coast between Halskov Lighthouse and the steam ferry harbor.

Ærteö, a rocky shoal, with a depth of 2 feet over it, lies on the south side of the fairway to Korsör Harbor, and is about 600 yards from the shore.

Badstue Cliff, the projection of the coast, about 800 yards southward of Korsör Church, terminates in a cliff 20 feet high.

Badstue Reef, a rocky reef with rocks awash and above water, extends in a westerly direction from Badstue Cliff; Blinde Badstue, a group of rocks, with 2 to 3 feet over it, lies on this reef at about 600 yards offshore.

Buoys.—A white can buoy, surmounted by one down-turned broom, is moored, in a depth of 3 fathoms, close southward of Lygtepulle.

A red conical buoy, surmounted by two upturned brooms, is moored in a depth of 4½ fathoms northwest of Ærteö.

A red conical buoy, surmounted by an upturned broom, is moored in a depth of 4½ fathoms southwest of the entrance of Badstue Reef.

Ny Ground, lying westward of Badstue Reef, and 1¾ miles offshore, has a least depth of 2¾ fathoms, which depth is also found on a wreck lying on its southeast side and close to the 5-fathom contour line.

Shoals.—There are also the following detached shoals on either side of the fairway to Korsör: On the north side a shoal about 800 yards in length in an east-northeast and opposite direction, with from 3 to 3¼ fathoms, lying about ½ mile southwest by south, and a patch of 2¾ fathoms 600 yards southeast by south of the outermost Kragepuller.

On the south side are two patches of 3¼ fathoms at about 1,200 and 1,800 yards south by east of the outermost Kragepuller, and one of 2¾ fathoms about 1,100 yards southeast by east of the same danger.

Light.—A group flashing light, with white, red, and green sectors elevated 33 feet, is shown from a red framework structure 39 feet in height, standing on the eastern edge of the 2¾-fathom shoal situated on the southern side of the fairway to Korsör Harbor.

The white and red lights are visible 11 miles and the green light 10 miles. (For limits of sectors, see Light List and Chart.)

Fog signal.—A siren gives three blasts in quick succession every 30 seconds.

Leading lights.—Two fixed red leading lights are exhibited at elevations of 60 and 27 feet above high water; they are in line, bearing 74°, and are visible 13 and 10 miles, respectively, being visible for 6° on each side of the leading line and then decreasing rapidly till obscured. The higher light is shown from a white standard 56 feet in height, surmounted by a triangle, and the lower light from a similar standard 36 feet in height.

Various red and green lights are shown at the ferry harbors when mail steamers or ferry boats are arriving or departing. (See Light List.)

Fog signals.—A fog triangle is struck; blue lights are burnt on the southern end of the breakwater.

Korsör Harbor.—A breakwater about 650 feet in length in a south by west direction and a detached breakwater 1,150 feet in a northwest and opposite direction protect the entrance to Korsör Harbor from the westward, which within is entered between the land on the north and a peninsula about 270 yards wide on the south; from its inner entrance the harbor extends about 400 yards eastward and then 600 yards southward to a swing bridge, with a general width of about 150 yards; the entrance between the breakwater heads is about 450 feet in width, but the harbor contracts to about 250 feet in width inside.

There is about 6,000 feet of quay space, partly of wood and partly stone, the depth alongside being 3½ fathoms. The railway runs on to the quays, which are lighted by gas and electricity. As a rule the eastern quay is reserved for steamers, and the steam-ferry wharves are on the north side. The piers are to be lengthened about

500 feet; the port is to have an increased area of about 3 acres; and the quayage will be extended.

Lights.—On the south end of north breakwater a beacon, 9 feet in height, exhibits, at an elevation of 16 feet above high water, an occulting light, having red and green sectors.

A red beacon, 5 feet in height, with a gray lantern on the north end of south breakwater, exhibits, at an elevation of 11 feet above high water, an occulting light, having red and green sectors. (For sectors, see Light List.)

Depths.—The depth in the entrance, and in the harbor, is 3½ fathoms, but gales between northwest and northeast raise the level 3 feet, and those between south and east lower it 2 feet.

Anchorage.—Large vessels anchor southward of the line of the leading lights, between Ny Ground and Badstue Reef, with the highest part of Höj Cliff in line with the outermost house on Halskov. Small vessels go inside the breakwaters, or anchor in Sengen, with Halskov Light building bearing about 40°.

Ice breakers.—Two ice breakers are for use at Korsör, and the ferry steamers are specially constructed for ice breaking.

Pilots.—Pilotage is compulsory for vessels over 20 tons, and the pilots take vessels as far north as Kallundborg, as far west as Svendborg Fiord, south to Nakskov Fiord, and east to Masned Sound.

Tug.—The services of a tug are available.

Directions.—Coming from the northward, Korsör water tower in line with the middle of the castle buildings, bearing about 93°, leads in a depth of 3 fathoms, southward of Halskov Reef and Kragepuller, and close southward of Lygtepulle, after which the vessel should be kept somewhat southward of the mark, and when the leading light beacons come in line, 74°, they lead to the harbor; coming from the westward they lead direct between Ny Ground and the shoals southwestward of Kragepuller into the harbor in a depth of 3¼ fathoms.

Tides.—It is high water, full and change, in Korsör Harbor at 0h. 10m.; the ordinary difference between high and low water is about 1 foot.

Tidal streams.—The tidal streams run strongly in and out of Korsör Nor, through the harbor and entrance.

Tidal signals are made at the entrance when the mail steamer or ferry are expected.

Ice.—The harbor has not been closed by ice for 16 years.

Town.—Korsör, a town with a population of 8,109 in 1910, lies on both sides of the entrance to Korsör Nor, and is of consequence on account of being the terminus of the most important rail route in Denmark.

Communication.—Daily communication with Kiel, by the Danish Royal Mail and Imperial German steamers, also to Rudkjöbing by Sydfvensk steam vessels; a steam ferry crosses to Nyborg eight or nine times daily.

Korsör is a station on the railway between Fredericia, Nyborg, and Copenhagen, and it and the post and telegraph offices are at the harbor.

Coal and supplies.—About 10,000 tons of coal are stocked, half the amount belonging to the railway company, and good lighters, holding 200 tons, are available; there is a coal wharf, 1,400 feet in length, at the east quay, and one 800 feet at the south quay. About 150,000 tons of coal are imported annually, and about 100,000 gallons of oil can be stored.

Supplies of fresh provisions may be procured, and water of excellent quality is laid on the quays, but there is no water tank; the water is suitable for small tube boilers.

Repairs.—There is a fixed crane, which will lift 10 tons, and three movable cranes. A salvage steamer and divers can be obtained.

Time signal.—A time signal is given daily at 1h. 0m. 0s., mid-European time, at the telegraph office. (See Chapter I.)

Trade.—The exports are agricultural produce, and imports coal and feeding stuffs. The manufacturers consist of boat building, making fishing nets, margarine, and there are iron foundries and tile works.

West side—Kjerteminde Bay.—The coast between Stavres Head and Risinge Head 3¾ miles apart, recedes nearly 3 miles, and forms Kjerteminde Bay, at the head of which is the town of the same name. The depths in the bay are from 6 to 7 fathoms, over clay and ooze.

Kjerteminde town, with its church and flour mill, are very conspicuous objects from the Belt; the church is red, and has a square tower at its west end, and on the east end is a small spire. On the north side of the bay is Hverringe country house, surrounded by woods, and on the south Lundsgaard mansion house, also in woods, while southeast of it is a high, steep cliff, projecting to seaward.

Depths offshore.—The 5-fathoms contour line surrounds the bay at distances of from ½ to ⅔ mile, the shore bank, to the 3-fathom contour line, being about half that distance off.

Mölle Ground, the north end of which is about ¾ mile southward of Stavres Head, extends nearly 1 mile southward, with depths of from 3¼ to 3½ fathoms. A bank, nearly a mile in length, in a northwest and opposite direction, and depths of from 4 to 4½ fathoms, lies between Mölle Ground and Stavres Head

Clearing marks.—Bögebjerg, just open eastward of Stavres Head bearing 335°, leads eastward.

The tower of Kjerteminde Church in line with its small spire, about 270°, leads southward of Mölle Ground.

Ice.—Average ice conditions, see Appendix.

Kjerteminde Harbor, at the entrance to Kjerteminde Nor, has two breakwaters extending in an east-northeast direction, the northern about 490, and the southern 650, feet in length, the entrance between their heads being about 140 feet.

The depth in the entrance is 2½ fathoms, and alongside the northern quays there are from 2¼ to 3 fathoms water, but winds from northwest, through north, to northeast, raise the level 2 feet, and southerly winds lower it 3 feet. It admits vessels drawing 16 feet water, but those over 120 feet in length can not turn in it.

Light.—A fixed green light is exhibited, at an elevation of 12 feet above high water, from a white, square building, on the north breakwater head; it is visible 4 miles.

Beacon.—On the south breakwater head is a black pole beacon, surmounted by a barrel.

Buoys.—The south side of the channel to the harbor is buoyed in accordance with the system, and there is a warping buoy on each side of the channel.

Pilots may be obtained for the harbor; also for Korsör, Nyborg, Kallundborg, and Odense Fiord.

Anchorage.—Kjerteminde Bay affords good anchorage with offshore winds, but easterly winds send in a short sea; the best anchorage is with Kjerteminde Church Tower in line with its small spire, bearing about 270°, and the holding ground is sufficiently good for a vessel to ride out almost any weather.

Tidal streams.—Ebb and flood streams are regular in settled weather, and owing to Kjerteminde Nor, they run strongly through the harbor, and with the flood stream entry is difficult for small craft, and inaccessible for larger vessels.

Currents.—Both the north-going and the south-going currents set weakly in Kjerteminde Bay.

Town.—Kjerteminde Town, situated on the north side of the entrance to Kjerteminde Nor, had a population of 2,594 in 1910; two bridges, the railway running on the eastern, cross the inner part of the harbor from the town to the south side.

Communication.—The railway runs westward to Odense, and northward to Dalby, the station, post, and telegraph offices being near the harbor.

Coal and supplies.—About 7,000 tons of coal are kept in stock; fresh provisions may be obtained, and water from the town waterworks.

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Coast—Risinge Head to Knuds Head.—From Risinge Head the western shore of the Belt trending in a south-southeast direction, for nearly 9 miles, to Knuds Head, is generally wooded, and presents few very conspicuous marks. Rynkeby Church, white, with a square tower and red roof, is conspicuous, but Revninge and Flödstrup Churches are only seen on certain bearings over the tops of the trees; Skalkenbjerg, a hill 144 feet high, and nearly midway between Kjerteminde and Nyborg, may be recognized.

Southward of Skalkenbjerg lies Juelsborg, Teglgaard, and Christianslund woods, a marine hotel and farther inland Nyborg Church, with its high, thin spire, which may be distinguished from a considerable distance.

Nyborg telegraph, with a white tower and black superstructure, is situated west-northwest of the church, and is conspicuous from the eastward and southward in the Belt.

Östero Peninsula stretches for a distance of about 2 miles south-southeast of Nyborg, and terminates in Knuds Head, its eastern cliff, and the east point of Fyen; 1 mile westward of Knuds Head is Klint Harbor.

Depths offshore.—The 5-fathoms contour line, passing about 800 yards outside Risinge Head, is about 1 mile off in places on this stretch of coast, the shore bank, to the 3-fathom contour line, being from 600 yards to ½ mile off.

A rocky shoal, with a depth of 1¼ fathoms, lies ½ mile offshore, 2 miles southeastward of Risinge Head.

Aalehus rön, a rock with 1 fathom water over it, lies 600 yards off the coast, nearly 1½ miles north-northwest of Knuds Head and Pilebenet; rocky ground, with a least depth of 1 fathom, is situated 300 yards northward of Knuds Head Mole.

Knuds Head is a grassy-covered bluff, about 20 feet high, with a lighthouse on it, which is not conspicuous, although a low white dwelling eastward of it assists in pointing out its position.

Light.—On the extreme of Knuds Head is a cylindrical gray iron tower, 23 feet in height, which exhibits, at an elevation of 45 feet above high water, a fixed light, having white, red, and green sectors; the white and red lights are visible 12 miles and the green light 9 miles. (For sectors, see Light List.)

Fog signal.—An explosive fog signal gives a double report when the mail or ferry steamers are expected.

Submarine telegraph cables.—Telegraph cables cross the belt from the coast northward of Knuds Head, passing both to the northward and to the southward of Sprogö; their direction is marked on the Fyen coast by two large white beacons, situated about 1¾ miles northward, and a similar pair about ⅓ mile northward of Knuds Head.

Lightbuoy.—A red lightbuoy, exhibiting a flashing white light, showing a quick flash every three seconds, is moored in a depth of 7¾ fathoms, 1,100 yards southeastward of the lighthouse.

Knuds Head Pier.—A pier, extending about 1,000 feet in length in an east-northeast direction, from about 400 yards northward of Knuds Head, has a depth of 3 fathoms along its extreme, but northerly winds raise the water about 4 feet, while those from the southward lower it 2 feet. The mail steamers from Zealand use this pier when ice prevents entering Nyborg, which is seldom the case; the railway runs on it, the station being just within, and some conspicuous white houses are to the northward of it.

Light.—On the extremity of the pier is a gray cylindrical tower, 10 feet in height, which exhibits, at an elevation of 16 feet above high water, a fixed light, with red and green sectors; the red light is visible 5 miles and the green light 4 miles. The lighthouse is not conspicuous.

Fog signal.—During thick or foggy weather a fogbell is struck by machinery four times in quick succession every 30 seconds.

Current.—The current runs strongly around the pierhead.

Sprogö, lying about midway between Knuds Head and Haltskov, and dividing the Belt into two channels, is about 2 miles in length and narrow; it is grassy, nearly bare of trees, and at its eastern end is a hill 82 feet in height, on which stands the lighthouse.

A number of buildings, situated on lower ground westward of the lighthouse, are used for the accommodation of those crossing the Belt during winter in ice boats, if driven to seek shelter, and there is a boat-landing pier on the north and south side, abreast the buildings, for their use; at the west end of the island is a white house, known as the Icehouse.

Light.—A circular yellow tower, 61 feet in height, with red bands, standing on the easternmost and highest part of Sprogö, exhibits, at an elevation of 144 feet above high water, a white group flashing light visible 18 miles.

Ice signals.—A ball hoisted on a horizontal spar, on the east or west side of the lighthouse, indicates ice in the East or West Channel, respectively.

One ball, hoisted as described, indicates "Navigation is closed for sailing vessels." Two balls, vertical, indicate "Navigation is only possible for powerful steamships."

In the case of the same signal being shown for both channels a square blue flag may be hoisted on the side on which the lighthouse keeper considers the ice conditions are better.

Sprogö Northeast Pulle is a small patch with a depth of 2¾ fathoms over it, lying surrounded by depths of 5½ to 11 fathoms, 2.2 miles northeast of Sprogö Lighthouse.

The 5-fathom contour line, and a prong of the shore bank, surrounding Sprogö, are close together, at about 1½ miles northeast of the lighthouse, from which the former line turns southward, inclosing East Reef.

Buoy.—A red conical buoy, surmounted by three upturned brooms, is moored, in a depth of 7 fathoms, northeast of Northeast Pulle.

Sprogö East Reef, which stretches for a distance of about 1½ miles east-northeast from the east point of Sprogö, with breadths of from 100 to 200 yards within the 2-fathom contour line, consists of clay and rocks, with depths of from 1 foot to 1 fathom, and breaks down steeply to 5 fathoms at its eastern end.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 6 fathoms, 200 yards eastward of the east end of East Reef.

The 10-fathom contour line is nearly ½ mile north-northeast of the buoy.

West Reef, extending about 600 yards from the west point of Sprogö, in a westerly direction, is a small rocky ridge, with a depth of about ½ fathom over it, its outer end, with 3 fathoms water, being ½ mile westward. On both sides of the ridge are sand and small stones.

The 5-fathom contour line, which incloses West Reef, trends eastward of the northeast extreme, already mentioned, passing about ⅝ mile northward of Sprogö, with the 3-fathom contour close to it.

Buoy.—A white can buoy, surmounted by a down-turned broom, is moored in a depth of 5 fathoms off the west end of West Reef.

Telegraph buoy.—A black spar buoy, surmounted by a white diamond between two red balls, is moored, in a depth of 19½ fathoms, 1.3 miles northward of the lighthouse, to mark the line of telegraph cables.

Gjelle Ground.—The 10-fathom contour line, which, from 2¾ miles northeastward of the lighthouse trends to the southward for 3¼ miles, forming the west side of East Channel and passing close to the 5-fathom line, abreast of East Reef, turns southwestward for a similar distance, inclosing a number of shoals, of which Gjelle Ground is the largest and outermost, southward of Sprogö. It has several patches of rocks, the outermost, with a depth of 1¾ fathoms, being 1.2 miles southward of the lighthouse.

Lightbuoy.—A red and white vertically striped buoy, exhibiting a flashing red light, with a period of three seconds, showing: Flash, three-tenths of a second; eclipse, two and seven-tenths seconds, is moored in a depth of 6 fathoms southward of the Gjelle Ground.

Telegraph buoys.—The telegraph cable southward of Sprogö is marked by a black spar buoy, surmounted by a white diamond,

between two red balls, and also by two white spar buoys, surmounted by white flags.

Sprogö Puller are a number of patches of clay and stones lying westward of Gjelle Ground with a least depth of 3 fathoms and from 5 to 11 fathoms in a channel between them, but the latter is useless for the purposes of navigation.

Between Sprogö Puller and the west side of Langeland, and northward of Vresen and Vresen Puller, there are depths of from 8 to 14 fathoms, and several rocky shoals, surrounded by deep water; the two most important of these are:

West Puller, two shoals, with 3¼ and 4 fathoms, lie 1½ miles eastward of Knuds Head.

East Puller, a group of patches with a least depth of 3¼ fathoms, lies 1½ miles southeastward of West Puller.

Dronning Maries Puller, 1 mile south-southwest of East Puller, and separated by a channel in which is a depth of from 4 to 6½ fathoms are several patches of rock with a least depth of 3¼ fathoms.

East Channel, the channel eastward of Sprogö, is about 3½ miles in length, in a north and south direction, with a least breadth of 1,400 yards between the 10-fathom contour lines on each side, at its southern part; it has depths of from 25 to 29 fathoms in mid-channel, and being clear of dangers, broader, and more direct than West Channel is to be preferred to it for a deep-draft vessel.

Directions.—A vessel of deep draft coming from the northward, having passed between Romsö and Elephant Grund, and steering 166° for Sprogö Lighthouse, should, when the southwest extreme of Halskov bears 137°, steer for it on that bearing, and when Halskov Reef Light and Whistlebuoy is sighted, about 167°, steer to pass about 400 yards westward of it, observing that Boeslunde Church, in line with the north side of Korsör Castle tower, bearing 113°, leads northward of Sprogö Nord-öst Pulle in a depth of 7 fathoms.

Sprogö Northeast Pulle is passed when Svinninge Church is open southward of Knuds Head, 233°, and the vessel is southward of Halskov Reef when Korsör Water Tower is in line with the middle of Korsör Castle buildings, 94°, to clear the 3¼-fathom shoal, which lies 600 yards inside the 10-fathom contour line, southward of Sprogö, Skalkenbjerg, on Fyen, should not be brought in line with the west point of Sprogö, bearing 289°, until Slots Bjergby Church is in line with Korsör leading light structures, bearing 71°. For continuation to the southward, see below.

In thick weather the navigation of East Channel is dangerous for a deep-draft vessel, and if coming from the north, Halskov should be steered for, guided by the lead till in depths of from 8 to 11 fathoms, when a south-southwest course should be shaped, keeping

in these depths and sounding continually. This course will lead westward of the light and whistlebuoy, but if it is not made out continue the course until in the deep channel and soundings of 20 fathoms and above are obtained, when steer more to the southward to avoid the 3¼-fathom shoal southeast of Sprogö.

As the southgoing current is deflected to the southwestward by Halskov Reef and that to the northward sets away from that reef, in neither case would a vessel following these directions be dangerously affected by them.

A vessel from the southward should keep on the eastern side of the deep channel, in a depth of 16 fathoms, and then steer about north-northwest until in 20 fathoms or a greater depth, when steer north until the water shoals southwest of Slettings Ground.

By night.—Sprogö and Halskov Lights, as well as Halskov Reef Lightbuoy, are all good guides, and the latter may be steered for, bearing 134°, until Halskov Reef Light and Whistlebuoy bears 167°, when course should be altered to pass 400 yards westward of it.

Halskov Light, bearing about 127°, and just shut in by Höj Cliff, leads 1 mile northeastward of Sprogö Pulle.

West Channel, the channel westward of Sprogö, is about 2⅔ miles in width at its northern part, but farther south it is contracted to about ½ mile, eastward of Knuds Head, between the 10-fathom contour lines; the depths in the northern part are from 11 to 14 fathoms, and from 11 to 12 in the narrowest part, although there is a breadth of about 1¼ miles, with depths of from 7 to 9 fathoms, eastward of Knuds Head.

Large vessels frequently use this channel, with a view to obtaining a pilot from the principal pilot station at Slipshavn.

Directions.—A vessel of deep draft, being in a position midway between Elephant Ground and Romsö, and intending to pass through West Channel, should steer 176°, to pass about 1 mile eastward of Knuds Head, observing, when northward of that point, that the south side of Kejberg Wood, in line with Knuds Head Lighthouse, bearing 226°, leads northwest of the shoals westward of Sprogö, and a conspicuous gap in Glorup Wood, in line with Taarup Church, painted red, with a slender, tall spire, bearing about 225°, leads westward of Sprogö Puller.

In thick weather a vessel will pass about ⅔ mile eastward of Knuds Head by keeping in depths of from 8 to 10 fathoms, but it would be prduent for a deep-draft vessel not to go into a less depth than 10 fathoms, and to anchor near Knuds Head till the weather clears and the leading marks can be distinguished.

By night, vessels must be guided by the lights and by the lead, not shoaling the water on either side to less than 10 fathoms in a deep-draft vessel. For continuation to the southward see below.

Currents.—The currents sometimes run strongly, and from abreast Sprogö to 3 miles northward of a line joining that island and Knuds Head their general direction is either northwest or southeast, but southward of Sprogö, owing to shoals and the irregular bottom, they are variable, these sometimes deflecting them as much as four points from the general direction.

Directions—Southward of Sprogö.—Vessels using West Channel and intending to pass eastward of the line of shoals extending from Sprogö to Langeland, can do so by three different channels through the line.

North Passage, between Sprogö Puller on the north and West and East Puller on the south, is the broadest and deepest, and when steering for it the gap in Glorup Wood, in line with Taarup Church, already given, must not be crossed until Borgeskov farm buildings are in line with the south side of Christianslund Wood, bearing about 292°, and Nyborg telegraph well open north of Nyborg Church, and in line with the south side of the town hall, 291°, leads as a stern mark, northward of West and East Puller, in depths of from 5¼ to 14 fathoms, the former depth being on a small patch, lying about 1,600 yards southeast of West Puller.

The south side of Slipshavn Wood, in line with Knuds Head Lighthouse, bearing 246°, is also a good mark for leading through this channel, passing about ¼ mile northward of West Puller. The edges of this wood are so clearly defined that from a distance it appears as an island.

Having passed through this channel, and being bound for Korsör, Gjelle Ground, and the dangers southeast of Sprogö will be cleared on the south side by keeping Slots Bjergby and Korsör churches in line, bearing 70°, which mark also leads between West and East Puller.

By night, the lights and lead are sufficient guides, and this channel must be used by deep-draft vessels, but they should not go into a less depth than 10 fathoms on either side, except off Knuds Head. Small vessels can navigate the whole broad passage between Sprogö Puller and Vresen Puller, the sector of fixed green light from Knuds Head covering the southern dangers.

Middle Passage, between West and East Puller, on the north, and Dronning Maries Puller on the south, has not less than 6 fathoms water if the leading mark, which is the eastern telegraph beacon on Knuds Head, in line with Nyborg Church, bearing 300°, be closely followed.

South Passage, between Dronning Maries Puller and Vresen, is narrow, with an irregular bottom, but by keeping a gap in Juelsberg Wood in line with Knuds Head Lighthouse, bearing about 318°, not less than 4¾ fathoms will be obtained in it.

Nyborg Fiord extends for a distance of about 2 miles in a northwest direction, on the west side of Österö Peninsula, with a general breadth of about 1 mile, but is contracted to nearly half that distance by shoals; it has depths of from 5½ to 9 fathoms in the outer part, and from 5 to 6 fathoms farther in, and affords safe anchorage with all winds, even for large vessels.

Knuds Head Flat.—The southeast end of Österö Peninsula, about 1 mile broad, is fronted by a shoal flat, which extends about ½ mile from it, with depths of from 2 to 2½ fathoms, and 100 yards from the middle of the shore of this end is Lille Knud, a rock with a depth of 11 feet over it, and 300 yards off another rock with 9 feet.

Lightbuoy.—A red buoy, exhibiting a flashing white light, with a period of three seconds, is moored off the south side of Knuds Head Flat and about ⅔ mile southward of Knuds Head Pier.

Slips Point, the low southwest point of Österö, and the eastern entrance point to Nyborg Fiord, has on it the lighthouse, the remains of an old fort, and several other buildings.

Light.—A red iron beacon 16 feet in height is situated on Slips Point, and exhibits, at an elevation of 20 feet above high water, a group flashing white light, visible 9 miles.

Fogsignal.—During thick or foggy weather a fog gun is fired, a bell sounded, and blue lights burned when the ferry steamer is expected.

Slipshavn, immediately northward of Slips Point, is a small harbor, with two short moles extending westward, alongside the northern of which is a depth of 1½ fathoms, but winds from west by south, through north, to northeast by north, raise the level 3 feet, and those from other quarters lower it the same amount; this havn is used by the mail steamers when Nyborg Harbor is closed by ice.

Pilots.—As already mentioned, Slipshavn is the principal pilot station in the Great Belt, and the pilots can undertake uninterrupted pilotage through the Great Belt to Schultz's Ground to the Sound, the Skaw, or to Bornholm.

Tides.—It is high water, full and change, in Slipshavn, at 0h. 16m., the ordinary difference between high and low water being about 1 foot.

Communication.—There is a daily post to Nyborg and telephonic communication with that place.

Northeast side of the fiord.—The southeast side of Österö, between Slips Point and Nyborg, a distance of about 1½ miles, recedes for ½ mile, forming a shallow bight, filled by Lindholm Flat, on which the depths are from 2 feet to 1 fathom, over a bottom of rocks, clay, and sand, and lying near the edge of this bank, and about midway of the distance is Lindholm, a small grassy and uninhabited island.

Lindholm Shoal, the outer part of Lindholm Flat, and separated from it by a shallow channel, used by small vessels, has depths of 2 feet, over a bottom of stones, clay, and sand.

Hav Shoal, northward of Lindholm Shoal, extends southward from near the stream ferry piers, and has from 1 foot to 5 feet water over it.

Lightbuoy.—On the edge of Lindholm Shoal, and about ½ mile southwest of Lindholm, is a red buoy, which exhibits a flashing white light, with a period of three seconds; it is moored in a depth of 4¼ fathoms.

Buoys.—The southwest side of Lindholm Shoal is marked by three red spar buoys, each surmounted by an upturned broom, the southern marking the south part of the shoal known as Tungen, and the northern, marking the northwest part, named Stenhöjen.

The southwest side of Hav Ground is marked by two red spar buoys, each surmounted by an upturned broom.

Southwest side.—The southwest side of the fiord is high and wooded in places, Kejberg wood, at the southern part, being about 1 mile in length; westward of its north end is Kogsbölle, a somewhat flat hill, 211 feet high, with a large rock on its summit, which was a trigonometrical station.

About 1 mile northward of Ko wood, the north part of Kejberg wood, is Holckenhavn Creek, which extends about 1½ miles westward, having on its south side Holckenhavn house, or castle, a yellow building with a square tower, and conspicuous from seaward. Northward of Holckenhavn Creek are Dyrehave mansion house, mill, and wood; on the eastern side of the latter are the white leading beacons.

Nyborg is at the head of fiord, and westward of it is the poorhouse, a large red building: inland, farther westward, is Vindinge Church, white, with a very jagged gable.

Hvide Shoal.—Abreast of Kejberg Wood the 5-fathoms contour line is fully 1 mile offshore, and from the north end of the wood, Hvide Shoal, with a least depth of 1¼ fathoms, stretches eastward for ⅔ mile to the 3-fathoms contour line; the bottom on Hvide Shoal is light-colored sand and weeds. On the north side of the shoal a white spar buoy, surmounted by two straw wisps, is moored in a depth of 2 fathoms.

Slots Shoal.—Holckenhavn Skanse Point, southward of the fiord, has high, partially wooded cliffs, and 340 yards southeast of it is a rock with a depth of 4 feet, while 600 yards north by east of it is Slots Shoal, with 1¼ fathoms, over hard sand and rock.

Holckenhavn Bay, the bay at the entrance to Holckenhavn Creek, has a shore bank, shoaling rapidly, extending from its south side, and on the north is Avernakke Point, which is low, with Avernakke Hook, some rocks with from 2 to 5 feet over them, extending

600 yards southward of it. Two hundred yards farther south is Dynen, a large rock with 1 foot water over it.

Leading lights.—Two fixed white leading lights are exhibited at elevations of 42 and 13 feet above high water, from white beacons 16 and 30 feet in height, respectively, surmounted by disks; they are situated on Jomfruhoj, eastward of Dyrehave Wood, and near Avernakke Point, and are 60 yards apart, and in line bearing 306°. In clear weather the higher light should be visible from a distance of 12 miles, and the lower from 8 miles, and for 5° on either side of the line of bearing.

Two fixed red lantern lights are shown from tripods on Avernakke Point for the use of the ferry steamers, and a fog horn is sounded and blue lights burnt.

Buoys.—Avernakke Hook is marked by two white spar buoys, each surmounted by straw wisps; they are in a depth of 2 fathoms 200 yards from the point. Dynen is marked by a similar buoy, 300 yards from the point.

Nyborg Harbor, at the head of the fiord, has several quays stretching southward and southwestward on its east side, and a large mole on the west, and between these is about 150 yards in width and extends northward about 400 yards, its total area being about 18 acres.

It is divided into four parts, the largest portion, know as New Harbor, being on the outer and western side, eastward of which is Dampfærge Harbor, or Steam Ferry Harbor; at the head, and divided by a pier extending south, are East and West Harbors, respectively.

The quays, of which there is an extent of ¾ mile in length, with depths of from 14 to 24 feet alongside, are lighted by electricity and gas, and have the railway running on them.

Lights.—On the mole at the western side of the entrance two fixed white leading lights are exhibited, at elevations of 22 and 14 feet above high water, from square white structures on posts; they are 120 yards apart, in line bearing 330°, and the higher light is visible 9 miles and the lower 8 miles.

At the eastern end of the above mole a fixed yellow light is shown from a post a an elevation of 20 feet.

From a pole at the extreme of the pier which separates East and West Harbors a fixed red light is exhibited, at an elevation of 11 feet above high water.

On the arrival and departure of the steam ferry, fixed white, red, and green lights are also shown.

Fog signal.—A large steel triangle is struck for the use of the steam ferry.

Depths.—The harbor is approached through a dredged channel, with a least breadth of 130 feet, and having a depth of 4 fathoms, there being the same depth on the west side of New Harbor, the eastern side of which, with the steam ferry harbor, has about 2¼ fathoms. East Harbor, the entrance to which is about 100 feet in width, has a depth of 3 fathoms, and West Harbor, with a similar breadth of entrance, has from 1½ to 2¼ fathoms water.

Gales from west and northwest raise the water about 3 feet, and those from south and southeast lower it about 2 feet.

Icebreaker.—A powerful icebreaker, for use in the Great Belt, is stationed at Nyborg, but the port has not been closed since 1885.

Pilots can be obtained at Slipshavn.

Buoys.—A shoal area, with a least depth of 1¼ fathoms, in the northwest corner of New Harbor is marked on its southeast side by two white spar buoys, surmounted by wisps of straw.

Anchorages.—Large vessels will find the best anchorage off Holckenhavn Bay in a depth of 5 fathoms, with Nyborg telegraph in line with Avernakke Point, bearing about 332°, and Sprogö Lighthouse just open north of Lindholm, 70°, sheltered from all winds except from southeast, which may send in a little sea.

Small vessels have a choice of several anchorages.

Between Slipshavn and Lindholm Shoal, in depths of from 3 to 4 fathoms, or an inner anchorage in 2 fathoms, with Knuds Head Lighthouse open north of Slipshavn Pier, bearing 92°, and Klöver Hook open westward of Slips Point 186°.

Southward of Hav Shoal, in 2½ fathoms of water, with Nyborg telegraph open three times its own height from the steam ferry harbor mole, about 316°, and the east side of Christianslund Wood in line with the southernmost house near the beach of Holmhuse.

In Holckenhavn Bay, in depths of about 3½ fathoms, about 140 yards westward of the line of the leading beacons.

Vessels are prohibited from anchoring near the line of the leading lights.

Directions.—Coming from the northward the gap in Glorup Wood in line with Taarup church, bearing about 225°, leads southward of Knuds Head Flat, and the white leading beacons in line, 316°, leads southwest of the same shoal, Slips Point, and Lindholm Shoal, after which the square white light towers in line, bearing 330°, leads southwest of Lindholm Shoal and between Hav Ground and Avernakke Hook, and when Nyborg church is near the customhouse, a large yellow building in the harbor, the entrance may be steered for.

The northwest point of Sprogö, in line with Knuds Head, bearing 56°, leads over Knuds Head Flat, in a depth of 1¾ fathoms.

Ice.—The harbor is rarely closed by ice, and only for short periods; see Average ice conditions, Appendix.

Town.—The town of Nyborg, with about 8,458 inhabitants in 1910, occupies an important position on account of being connected by the State railway, and with Korsör and the Danish Islands by steam ferry.

Communication.—There is a weekly steamer to Copenhagen, and the steam ferry leaves for Korsör nine times daily, the time occupied between the places being 2¼ hours; the railway journey from Nyborg to Fredericia is about 2 hours, the distance being 52 miles. The post telegraph, and telephone offices are near the harbor.

Coal and supplies.—From 1,500 to 3,000 tons of coal are stocked, and about 22,000 tons are imported annually; a larger quantity of coal could be procured by giving two days' notice to the railway company. A coal wharf, 600 feet in length, has a depth of 4 fathoms alongside it.

Fresh provisions and vegetables are plentiful, and moderate in price; the supply of water from the town waterworks is filtered before being supplied to vessels, and there is a water boat; also tanks in the East and New Harbors.

Patent slip.—There is a small patent slip with lifting power of 250 tons.

Repairs.—Small repairs might be executed at the State railway workshop; fixed cranes lift 6 tons, and a transportable one will lift 10 tons.

Time signal.—A time signal is given daily at 1h. 0m. 0s. p. m., mid-European time, at the telegraph office. (See Chapter I.)

Trade.—The exports are agricultural produce, and imports feeding stuffs, coal, and timber. Manufacturers consist of beer, cheese, sausages, and vinegar.

Great Belt—West part.—The west part of the Great Belt is the channel which has, on its eastern side, the narrow ridge of shoals extending from Vresen Puller to the northwest side of Langeland, and the west coast of that island as far south as Næs Head. Its western boundary is the east coast of Fyen, from Kejberg Wood to Turö Reef.

Shoal Ridge—Vresen Puller to Smorstakken.—From Vresen Puller, on the south side of the channel southward to Dronning Maries Puller, a shallow ridge, about 1 mile in width, extends to the northwest end of Langeland; it is studded with shoals, has several passages through it, and on it lie Vresen, Langesand, and Smörstakken Islands.

Vresen Puller, the northern danger on this ridge, consists of a number of rocky shoals, with deep, narrow, and tortuous channels between them. The northernmost danger, with a depth of 2¾ fathoms, is about ⅓ mile southwest of Dronning Maries puller, and

about 1,200 yards south by west of this shoal is one of 1½ fathoms, which is the least water.

Buoy.—A red conical buoy, surmounted by three upturned brooms, is moored in a depth of 5½ fathoms, northeastward of Vresen Puller.

Vresen Island, situated about 1½ miles south by west of Vresen Puller, is about 12 feet high, grass covered, about ⅔ mile in length in a northeast and southwest direction, and from its north side a flat, about 1 mile in breadth, extends for a distance of about 1¼ miles, in the direction of Vresen Puller; at 1,800 yards from the island is a rocky head of 1¼ fathoms. A long shed, standing on the island, may be seen from a considerable distance, and forms a good mark.

A narrow ridge, with depths under 1 fathom, extends nearly 2 mile southward of the southwest point of Vresen, and the southern part of the flat has general depths of from 1½ to 3 fathoms, but there is a depth of 4 fathoms at a distance of about 1,400 yards southeast by east of the southwest end of Vresen.

Langesand Island, a grassy islet about 4 feet high, is situated on the northern part of the ridge, and southward of Vresen, being separated from it by a boat channel, in which there is a depth of about 5 feet, the ridge extending for 1,200 yards from it in a southerly direction, with less than 1 fathom water over it; the southern edge of the flat southward of Vresen and Langesand forms the north side of Kobber Deep.

Smörstakken are two small islands, about 3 feet high, composed of sand and rocks, and lying northwest of Lohals, on Langeland. The ridge, extending nearly 2½ miles northward of Smörstakken, has on it a spit, with very little water over it, extending for about ¾ mile from the northern island, and the remainder of the ridge has depths of from ¼ fathom to 2¼ fathoms; the north end of this ridge forms the south side of Kobber Deep.

Kobber Deep, the deepest channel through the ridge, southward of Vresen Puller, is about 1,600 yards southward of Langesand, and has depths of not less than 2 fathoms, over a breadth of 200 yards. Depths of from 6 to 12 fathoms are found in mid-channel, but a shoal of 2¼ fathoms contracts the western end; there is a rocky shoal of 1¼ fathoms off the southeast side. The channel should not be used without local knowledge.

Buoys.—A conical red buoy, surmounted by an upturned broom, is moored, in a depth of 2 fathoms, on the north side of the channel. A white can buoy, surmounted by a down-turned broom, is moored, in a depth of 3 fathoms, on the southeast side, and northward of the 1¼-fathom patch.

A white can buoy, surmounted by two down-turned brooms, is moored in 2 fathoms water, on the south side of the channel.

Smörstakke Channel, between the flat extending southward of Smörstakken and Röd Shoal and one of several channels across the ridge, southward of Kobber Deep, has a depth of about 10 feet, and is much used by vessels proceeding to Sevenborg Sound. Directions below.

Buoys.—A red spar buoy, surmounted by an upturned broom, is moored, in a depth of 1½ fathoms, on the north, and a white spar buoy, surmounted by two straw wisps, lies on the south side of the channel.

Current.—The current in this part of the Belt being influenced by that running in the main portion, also by currents from Sevenborg Sound and Rudkjöbing, is necessarily very variable, but it usually follows the direction of the channel.

Langeland—Northwest coast.—The northwest coast of Langeland is very hilly, with extensive woods in many places, between which are fields, surrounded by hedges, giving it the appearance of being even more densely wooded; several conical high hills, with trees on the summits, are a characteristic of the Langeland scenery. The population of Langeland was 19,541 in 1906.

Hov, the northernmost part of Langeland, terminates in Lille Hov, a small steep cliff, and a short distance sowthwest of it is Franke Cliff, a cliff appearing of a yellow color from seaward. Lohals, 2 miles from the north end of the island, has a well-sheltered harbor.

The most conspicuous objects on this coast are Hov Chapel, with a small pointed spire, and about 1 mile eastward of Lohals; but it is hidden by trees from the northward and southward. Skiften Mill, southeastward, and Stensgaard Mill, southward of Lohals, lie nearly midway between the east and west coasts.

Stoense Church, about 2½ miles southward of Lohals, and also about midway of the breadth of the island, with Snöde Church about ⅝ mile southward of it, Snöde Mill being between; to the westward of Snöde Church is Endebölle Mill.

Böstrup Church and Svalebölle Mill are close together in the middle of the island, 2 miles south-southwest of Snöde Church, but from the westward they can only be seen over the trees on certain bearings, and 3 miles farther south is Tranekjær Castle and Church, the former a large red building with a slender tower and standing on high ground; the church has a high pointed spire. Næs Head, about 2½ miles westward of Tranekjær Church, is the southern boundary of the west part of the Great Belt.

Hov Sand, consisting of sand and rock, extends in a north-northeast direction from the north end of Langeland, for a distance of 1¼ miles, to the 3-fathom contour line, the 5-fathom contour being 1⅝ miles from that end of the island; on its western side it is steep-to.

breaking down from 3 to 6 fathoms. This danger will be referred to later.

A rocky reef, with about 2 feet water over it, extends 275 yards northward of Lille Hov.

Buoys.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 5¼ fathoms on the west side of Hov Sand.

A white can buoy, surmounted by three down-turned brooms, is moored in 3¾ fathoms water on the north end of How Sand.

Franke Cliff, immediately southward of Lille Hov, is a yellow cliff.

Light.—From the gable of a white house, 13 feet in height, on Franke Cliff, a fixed light, having red and green sectors, is exhibited, at an elevation of 52 feet above high water; the red light is visible 8 miles, and the green light 6 miles. (For sectors, see Light List.)

Lohals is a rounded point 1⅝ miles southwestward of Franke Cliff, and from its northern side Lohals Hook, with depths under 1 fathom, extends for ¼ mile, being steep-to, with depths of 4¼ fathoms on its west and northwest sides.

Buoy.—A white spar buoy, surmounted by a down-turned broom, is moored on the west side of Lohals Hook.

Lohals Harbor is a small harbor, formed by a north breakwater, which extends first about 300 feet in a westerly direction, and then about the same distance south-southwest; and a south breakwater, extending about 250 feet from the shore to the southward, leaving an entrance between them 35 feet wide, facing south.

Depths.—The depths in the entrance are 2 fathoms, and from 1½ to 2 fathoms inside, but northeast winds raise the water 2 feet, and those from southwest lower it the same amount.

Light.—On the south breakwater head a white cylindrical iron tower, 19 feet in height, exhibits, at an elevation of 17 feet above high water, a fixed light, with white, red, and green sectors, which are visible, respectively, 9, 6, and 5 miles; it is shown from October 1 to March 1, except when ice obstructs. (For sectors, see Light List.)

Communication.—There is a post and telegraph office at Lohals village, which had a population of 496 in 1906.

Coal and supplies.—From 300 to 500 tons of coal are kept in stock; fresh provisions can be obtained, and generally water near the harbor.

Anchorage for small vessels may be obtained in depths of from 5 to 6 fathoms, off Lohals, with the main street of the village open.

Röd Shoal, fronting the shore southward of Lohals, and stretching 1½ miles southward of Smörstakke Channel, is about 1,800 yards in breadth, with variable depths, over foul rocky ground, the least depth being about 5 feet.

Stoense Channel, southward of Röd Shoal, has a general northeast and southwest direction, the greatest depth being 1¾ fathoms; a shoal with the same depth lies southward of the channel, close to depths of 4 fathoms.

Light.—A fixed white light is shown, except when ice prevents, from October 1 to March 1 on the coast abreast Stoense Channel.

Buoys.—The southeast, south, and southwest sides of Röd Shoal are each marked by red spar buoys, the two first having single upturned brooms, and the last two upturned brooms as top marks. The south side of Stoense Channel is marked by a white spar buoy, surmounted by two straw wisps. Directions below.

Coast—Dangers.—The coast between Stoense Channel and Næs Head, a distance of about 8 miles, is fronted by several dangers, extending from ½ to ¾ mile off; they are best shown by the chart.

Dagelykke Harbor, 5 miles southward of Lohals, is formed by two breakwaters, the northern, in a west-northwest direction, about 400 feet, and southern, bending northeast and northwest, about 480 feet in length, the entrance between their heads being about 50 feet in width.

The depth in the entrance and harbor are 1¾ fathoms, but northeast winds raise the water 4 feet, and those from south to southeast lower it the same amount.

Leading lights.—A fixed white light, elevated 15 feet, is exhibited from the south breakwater head, and another fixed white light, elevated 20 feet, on the east side of the harbor. Both lights are shown from gray post, the period of exhibition being from October 1 to April 1.

Dangers.—A shoal, with depths of 1½ fathoms, extends about 1,200 yards from the shore on the north side, and on the south side of the approach is Egelykke Reef, ¾ mile in length, in a north-northeast and opposite direction, with a least depth of 1¾ fathoms.

Buoys.—The south end of the shoal on the north side is marked by a white spar buoy surmounted by a straw wisp, and the north end of Egelykke Reef is marked by a red spar buoy surmounted by a broom.

The leading lights, bearing about east, lead between the buoys to the harbor.

Communication.—There is a daily steamer to Svendborg, and the post and telegraph offices are at Tranekjær.

Coal and supplies.—A small quantity of coal and supplies of fresh provisions and water may be obtained.

Aasö landing place, with a small pier, having a depth of 1¼ fathoms at its end, is 3¾ miles south-southwest of Dagelykke, but permission must be obtained before using it. Westward of the pier is Korsebölle Reef, a detached portion of which, ⅝ mile in length, in a northeast and southwest direction, has depths of from 2¾ to 3 fathoms, and is nearly 1 mile offshore.

Næs Head, the southern limit of the western part of the Great Belt, ends in a small cliff and has shoal water to the depth of 3 fathoms extending for fully ½ mile northward of it. For continuation of this coast, see below.

Fyen—East coast—Nyborg Fiord to Turö Reef.—The land between these points is high and slopes evenly to the coast, with large woods in several places, the fields being frequently hedged in, giving the country the appearance of being even more extensively wooded.

From the south side of Kejberg Wood the coast trends to the southward for 2 miles to Klöver Hook, a rounded projection, with a low cliff behind it, and then turns to the south-southwest for about 12½ miles, to the southeast point of Turö. The landmarks most likely to be distinguished are the chimneys of Lersey brickworks; Taarup Church, painted red, with a slender, dark-colored spire, which is situated about 1½ miles southward of Kejberg Wood; and west and southwest of its Frörup and Öxendrup churches, respectively; they are the ordinary village churches of the country. Svinninge Church, about 1½ miles westward of Öxendrup Church, is painted white, with a high, slender, and dark-colored spire, and is very conspicuous.

Teglgaard House and Kobber Deep Beacon are 1½ miles southward of Klöver Hook, and fully 1 mile southward of the beacon is Klintholm Storehouse, a large white building with a red roof; Klintholm is the loading place for Hesselager Farm.

Hesselager and Gudme churches are northwest and west, respectively, of Hesselager Farm, the former being the usual type of country church, and the latter having a little sharp spire; they are seen on certain bearings between the trees.

Lundeborg fishing village, with a small harbor, is 2¾ miles southward of Klintholm, and Ovre Church, standing high, painted white with a red roof, is about 2 miles southwest of Lundeborg. On a point about 1 mile north of Lundeborg is a small, cylindrical white structure resembling a light beacon.

Else Head is 2¼ miles southward of Lundeborg, and ½ mile southwest of it is Tidselholt Mansion House, a large red building with a small spire, and very conspicuous; 2 miles southwest of it is Lykkens Pröve Mill, standing on high ground among trees, while on Turö are two mills, one at the east and the other at the west end of that island.

Depths offshore.—The 5-fathom countour line, which incloses Hvide and Pale Shoals, is nearly 1½ miles offshore, abreast of the south end of Kejberg Wood, but southward of that as far as Klintholm, it is from 600 to 1,200 yards offshore. From Klintholm to 1 mile southward of Lundeborg it resumes its distance of 1½ miles, inclosing Stokkebæk and Ovre Flats; southward the 5-fathom contour is from 800 to 1,400 yards off, except fronting the entrance to Skaarupör Sound between Fyen and Turö, where it is again about 1½ miles. Except where outlying shoals exist off this coast, the shore bank to the 3-fathom contour line is generally from 400 to 1,200 yards offshore.

Pale Shoal, lying about midway on a line joining Knuds Head and Klöver Hook and abreast the south end of Kejberg Wood, is about 1 mile in length in a north and south direction, within the 5-fathom contour line, and has a least depth of 2 fathoms near its center.

Maemose Shoal extends in a southeast direction from the shore bank between Kejberg Wood and Klöver Hook, with a depth of 2¾ fathoms at 800 yards offshore.

Lersey Farm Pier extends for a distance of 82 feet from the shore northward of Klöver Hook, near Taarup Village and brickworks; it has a depth of 1¼ fathoms at its extreme. Landing is difficult at this pier with easterly winds.

Klöver Hook is the shore bank, on which there are some rocks which extend for 600 yards off the point of Klöver Hook with depths under 2 fathoms.

Beacon.—About 1½ miles south-southwest of Klöver Hook, and near the shore, is a beacon for use as a leading mark to lead through Kobber Deep; it is a white triangular frame, the triangular opening giving it the appearance of a black triangle inside a white one.

Stokkebæk Flat, lying about 1 mile offshore abreast of Stokkebæk house, with a channel in which there is a depth of 4 fathoms between, is nearly ½ mile in length in a north and south direction within the 3-fathom contour line, and has a least depth of 2 fathoms, which lies southward of the middle of the ground. A red conical buoy, surmounted by two upturned brooms, is moored in a depth of 3¾ fathoms, one cable eastward of the shoalest spot.

Lundeborg Harbor, about 5½ miles south-southwest of Klöver Hook, is formed by two breakwaters, each about 200 feet in length in an east-southeast direction, the northern turning to the southward for a similar distance, leaving an opening about 30 feet in width, facing southward.

The depth in the entrance is 1¼ fathoms and about 7 feet in the harbor, but north and northwest winds raise the level about 2 feet, while those from east lower it the same amount.

Light.—On the north breakwater head a fixed red light is exhibited at an elevation of 15 feet above high water from a white iron post; the light is shown from sunset to midnight from September 1 to May 1.

Buoys.—A red spar buoy, surmounted by a red flag, is moored eastward of the north breakwater end, and 100 yards southward of the south breakwater is a white spar buoy with a white flag.

Communication.—The railway, post, and telegraph offices are at Gudme, distant 3 miles, but there is a telephone at the harbor; the village has a population of about 300.

Coal and water.—A small quantity of coal is kept in stock, and water of good quality and plentiful in supply can be obtained near the harbor.

Ovre Flat, the southeastern of three patches which lie off Lundeborg, has a rocky shoal on it with a least depth of 2¼ fathoms; otherwise, the bottom is clay and seaweed; it is about 1 mile east-southeast of Lundeborg, with a patch of 2½ fathoms between, the third patch, with 3 fathoms water, being about 1 mile northeast of Lundeborg.

Else Head, about 2¼ miles south-southwest of Lundeborg, extends nearly ¼ mile from the line of coast and terminates in a small bluff 20 feet high; Tidselholt house, already mentioned, is about ½ mile southwest of Else Head.

Light.—A cylindrical gray tower, 26 feet in height, standing on the extreme of Else Head, exhibits at an elevation of 33 feet above high water a fixed light with white, red, and green sectors; the white light visible 11 miles, the red light 9 miles, and the green light 7 miles. (For sectors, see Light List.)

Reefs.—A small reef, with a depth of 4 fathoms, extends 300 yards eastward of Else Head.

At ⅝ mile southward of Tidselholt house a reef extends ½ mile offshore, having depths of less than 1 fathom at 400 yards, and 4 fathoms at its extreme.

Skarrupör Sound, between Fyen and Turö, is a boat channel, with depths of from 3 to 5 feet in the channel, which is narrow and crooked, with strong tidal streams at times.

Turö, a low island about 2½ miles in length in an east and west direction, and 1½ miles in width, is separated from Fyen by Skaarupör Sound; the island is fertile, well built over on the north, and wooded on the eastern side. The population of the island was 1,625 in 1906.

The village, with a church and mill, are near the northwest end; the church can be seen from the entrance to Svendborg Fiord, and from the channel to the northward. See also below.

Turö Reef, consisting of sand, rock, and gravel, extends in a southeast direction from the southeast point of Turö; there is a depth of 4 fathoms at 1,400 yards and of 2 fathoms at 1,200 yards. A red conical buoy surmounted by an upturned broom is moored in a depth of 3¼ fathoms, off the southeast end of Turö Reef.

Directions.—Having passed eastward of Knuds Head Flat, with the gap in Glorup Wood in line with Taarup Church, bearing about 225°, a white villa, near Stjerneskansen, just open to the eastward of Slipshavn Houses, bearing about 346°, leads close eastward of Pale Shoal in a depth of 5 fathoms, and when southward of Pale Shoal steer about 177°, to pass between Stokkebæk Flat and Smörstakken, keeping a little more to the westward when southward of the former shoal, the mark for leading eastward of it being Nyborg Town, open eastward of the point at Klöver Hook 348°.

When Sprogö Lighthouse is in line with Vresen, bearing 23°, steer 203°, with it as a stern mark, but this mark can seldom be distinguished in a vessel when southward of Lundeborg Harbor.

To pass between the 1½-fathom patch of Vresen Puller, and the flat northward of Vresen, Nyborg telegraph in line with a straw-thatched house at Slipshavn, bearing 314°, leads through in a depth of 2¾ fathoms.

By night.—Coming from the northward, and having passed Knuds Head, the sector of fixed white light from it, between the bearings of 359° and 4°, should be gradually entered, and a course about south steered in it, observing that the western limit of the light, 4°, leads close to Stokkebæk Flat, so that a vessel should keep toward the eastern limit until the fixed green sector of Else Head Light is passed, and the fixed white sector from the same lighthouse leads close eastward of Turö Reef.

Kobber Deep—Directions.—Svinninge Church, in line with Kobber Deep Beacon, bearing 281°, leads through Kobber Deep in a depth of 2¼ fathoms.

Smörstakke Channel—Directions.—The mark for leading through the middle of Smörstakke Channel is Skiften Mill in line with the north edge of the wood southward of Lohals, bearing 104°, with not less than 1½ fathoms water.

To lead northwestward of Röd Shoal Lille Hov should be just open northwest of Franke Cliff, bearing about 56°.

By night.—The sector of fixed white light from Lohals Lighthouse, bearing between 95° and 104°, leads through the channel in not less than 1¾ fathoms.

Stoense Channel—Directions.—The mark for leading between the buoys at the northern entrance is the east end of a conspicuous cliff in line with the west end of Stoense Cliff, after which the re-

mainder of the channel may be navigated by the buoys and the edges of the sand banks, which can be clearly seen throughout; Stoense Cliff can be approached by the lead, taking care to avoid Röd Shoal.

Franke Cliff, in line with the land north of Lohals, bearing 38°, leads westward of the shore bank, southward of Stoense Cliff, and may be used as a mark, when approaching from the southward.

Anchorages.—Large vessels can anchor in any part of the western part of the Great Belt, as the holding ground is good. In westerly winds the best anchorage is close under the coast of Fyen, and in those from the eastward off Lohals. (See above.)

Svendborg Sound, the narrow passage dividing Taasinge, on the one side, from Fyen and Turö, on the other, from its entrance between the southwest point of Turö and the east point of Taasinge to the west point of Taasinge, is about 8 miles in length.

On the south coast of Fyen, and opposite the north point of Taasinge, is Svendborg town, and that portion of the sound, from the entrance to Svendborg, will, for facility in describing, be known as the eastern part, while the remainder, westward of Svendborg, will be considered as the western part.

Eastern part.—Turö, the west coast of which forms the east side of Svendborg Sound, has been described. Taasinge, on the west side of the Sound, and the largest island southward of Fyen, is irregular in shape and about 6¼ miles in greatest length and the same in width; the western entrance point to Svendborg Sound is about 2¼ miles southward of the north point of the island. The population of Taasinge was 3,933 in 1906.

On the east coast, about ¼ mile southwest of the west entrance point, is Valdemar Castle, a large irregularly shaped edifice with a principal white building which has a dark blue roof, and about 1½ miles westward of it is a hill 221 feet high, on which is Bregninge Church, with a high spire, and close to it Bregninge Mill, both of these being conspicuous and forming good landmarks from considerable distances in the channels.

Dangers.—From Turö Reef, along the south coast of Turö, the shore bank, to the 3-fathom contour line, extends about 600 yards for the first half of the distance, and then closes to about 200 yards, but from Grönneodde, the east entrance point, a point of shoal extends about 400 yards in a south by west direction.

Buoy.—A red spar buoy, surmounted by two upturned brooms, is moored in a depth of 2 fathoms at the south end of the shoal from Grönneodde.

Middle Shoal, with a depth of 7 feet near its extreme, stretches for a distance of 1,600 yards, in an east by south direction from the western entrance point; the inner part, named Slots Hook, being a

rocky shoal extending about 600 yards off the point, with a channel in which there are depths of from 2 to 3 fathoms between it and the outer part of Middle Shoal.

Northward of Middle Shoal, and about 800 yards from the point, is a small detached shoal, with 1¾ fathoms water over it.

Bellbuoy.—A small bellbuoy is moored near the middle of the extreme of Middle Shoal.

Buoys.—On the north side of the extreme of Middle Shoal a white spar buoy, surmounted by a straw wisp, is moored in a depth of 2 fathoms, close northeast of the bell buoy. A white spar buoy, surmounted by a straw wisp, is moored in a depth of 1¾ fathoms northeastward of Slots Hook.

A similar buoy to the above, but surmounted by two straw wisps, is moored in a depth of 2½ fathoms close northward of the detached 1¾-fathom patch.

Entrance—Depths.—The entrance between Grönneodde and the point on the west side is about 800 yards in width, but the navigable channel is reduced by the shoals already mentioned to a breadth of little more than 200 yards, the depths being not less than 25 feet to Svendborg.

Leading lights.—On the east point of Taasinge, northward of Valdemar Castle, two fixed white leading lights are exhibited, at elevations of 49 and 36 feet above high water, from white poles, 26 and 22 feet in height, respectively, and surmounted by red balls; they are in line bearing 282°, and visible for 17° on each side of the leading line; in clear weather the higher light should be seen from a distance of 11 miles.

On the north side of the entrance to Turö Bund, two poles, similar to those of the preceding light, but 15 and 8 feet in height, exhibit, at elevations of 51 and 39 feet, respectively, above high water, fixed red leading lights, which are in line, bearing 347°, and visible for 12° on either side of the leading line.

At Pilekrog, on the east coast of Taasinge, and on the opposite side of the channel to Turö Bund, two fixed red lantern lights are exhibited, at elevations of 26 and 20 feet above high water, from green posts; they are in line, bearing 281°, and 33 yards apart.

At Christiansminde, about ¾ mile eastward of Svendborg, two fixed red leading lights are exhibited, from green posts, at elevations of 23 and 13 feet, respectively, above high water; they are in line, bearing about 344°, and are 65 yards apart.

When vessels are expected, fixed white lights are shown from spar beacons at Maarodde, Öredde, Troense Hook, and Grönneodde.

Shoal.—Between Maarodde, on Turö, and Troense, on Taasinge, is a shoal lying in mid-channel, which has a least depth of 7 feet; the navigable channel lies eastward of this shoal.

Buoyage.—The sides of the channel, as well as those of the above shoal, are marked by spar buoys, painted, and surmounted according to the Danish system. (See Chapter I.)

Pilots can be obtained at Troense and at Svendborg; they will take vessels to Rudkjöbing, Æröskjöbing, and Faaborg Fiord, to all the places in the Little Belt, and to Nyborg, Korsör, Skjelskör, and Albuen, also to Smaalands Farcandet, as far as Grönsund.

Turö Bund, an indentation stretching for more than 1 mile into the west coast of Turö, with a general breadth of about 600 yards, is used as a winter harbor by local small craft.

Piers.—A pier, with a depth of 1¼ fathoms at its extreme, extends from southward of Valdemar Castle.

Troense, a small fishing hamlet on the east coast of Taasinge, opposite Middle Shoal, has a pier with a depth of 3¼ fathoms at its head. A fixed white light is shown when a vessel is expected.

A pier about 100 yards in length, with a depth of 1¾ fathoms at its extreme, extends from the marine hotel at Christiansminde, and a fixed white lantern light is shown from its northwest end.

Prinse Pier, about ¼ mile southeastward of Christiansminde, is 20 feet in length, with a depth of 1½ fathoms at its end.

Directions.—Bregninge Church, in line with Valdemar Castle, bearing 272°, leads southward of the shoal off the south coast of Turö, in a depth of 4½ fathoms, and when the second pine wood, north of Bregninge Church, is in line with a grove near the shore, northward of Valdemar Castle, bearing about 280°, it will lead between Grönneodde and Middle Ground.

The two white posts, surmounted by red balls, for the leading lights, in line 282°, may also be used for this part of the channel.

When the western mill on Turö opens off the land, north of Grönneodde, 8°, the channel must be navigated by the buoys, and by the aid of the leading light posts, if they can be distinguished.

By night.—The fixed white lights on the east point of Taasinge, bearing 292°, lead between Grönneodde and Middle Ground, and the two fixed red lights on Turö, 347°, lead up the channel until Pilekrog fixed red lights come in line, 281°, which lead to the east end of the detached shoal in mid-channel, when Christiansminde Lights, in line, 344°, should be steered for.

Submarine telegraph cable.—A telegraph cable crosses the channel from near Troense to Turö, and its direction is marked on that island by two telegraph poles, each surmounted by a triangle.

Svendborg Harbor, a small triangular-shaped bay, about 600 yards across its entrance, and extending to the northward about the same distance, is situated on the north side of the sound, opposite the west end of the northern part of Taasinge, its entrance being partly filled by Frederiksö, an island with channels on each side of it and affording protection to the harbor.

The harbor is about 50 acres in extent, not including the island, which is about 6 acres, and the entrances on each side of the latter are about 300 feet in width. The quays are of wood, about 4,000 feet in length, and lighted by gas; vessels can berth all around the railway running on to the quays, so that they can load from or discharge to trucks. There are five grain elevators.

The ferry harbor, close to the southward of the town, has a depth of 6 feet.

Lights.—On the south point of Fredericksö a fixed green lantern light is exhibited at an elevation of 17 feet above high water.

At the end of the steamer wharf, on the west side of the western entrance, a fixed red light is exhibited from an iron post 12 feet in height, at an elevation of 17 feet above high water.

Four fixed white lights are shown at Vindeby, two on each side of the channel, when the ferry steamers arrive and depart.

Buoy.—A red and white striped spar buoy, surmounted by a broom over a wisp of straw, is moored in a depth of 1¾ fathoms, on the southwest side of the point of the shoal extending from the east point of Frederiksö, and on the west side of the eastern entrance. The edge of the shore bank extending westward of Frederiksö is marked by dolphins.

Depths.—The eastern entrance has a depth of 23 feet, and from 18 to 13 feet water in the center of the harbor and 23 feet alongside the quay.

The western entrance has a depth of 21 feet, and in the center of the harbor and alongside the west and north quay there is from 12 to 21 feet water, but the level is raised about 5 feet during gales from north to northeast and lowered a similar amount by gales from south to southwest.

One or two dredgers are usually at work.

Pilots may be obtained from the town, and small local steamers act as tugs.

Town.—Svendborg is a pleasantly situated town, with a population of 12,673 in 1910.

Communication.—Steamers run twice daily to Æröskjöbing, daily to the neighboring islands, and weekly to Nakskov, Odense, and Aarhus, and there is also a regular service to Copenhagen, Korsör, Rudkjöbing, Marstal, Faaborg, Sonderborg, and Flensborg. A steam ferry crosses the sound to Vindeby.

Svendborg is connected by rail with Odense, about 29 miles distant, and the railway station, post, and telegraph offices are close to the harbor.

Coal and supplies.—About 4,000 tons of coal are kept in stock, and about 40,000 tons are imported annually; the coal is delivered in wagons to vessels alongside, and in small craft to those at anchor;

there is no special coal wharf, and vessels may coal at the most convenient quay. About 250,000 gallons of oil can be stored.

Fresh provisions may be procured, and excellent water from the town waterworks, but being on the quays, it is only supplied to vessels alongside; it can not be used in water-tube boilers without being filtered.

Dock and patent slips.—There is a floating dock 129 feet in length over all; 42 feet breadth at entrance; depth on sill and on blocks 11½ feet at H. W. O. S. Lifting power 600 tons. There is also one small slip.

Repairs.—Small repairs to machinery and to iron vessels can be effected; a traveling crane will lift one ton, and a diver can be obtained.

Time signal.—A time signal is given every day at 1h. 0m. p. m., mid-European time, at the telegraph office. (See Chapter I.)

Trade.—The export is agricultural produce, and imports corn, feeding stuffs, and coal. The manufactures are cement, beer, and spirits, manure, and vinegar.

Submarine telegraph cable.—A telegraph cable crosses the sound from eastward of the ferry harbor at Svendborg to the ferry harbor at Vindeby. The direction of the cable is marked on Fyen by two white telegraph beacons.

The western part of Svendborg Sound is described in Chapter IX.

Lunke Bay, between the western entrance point to Svendborg Sound and Stenodde, the north extreme of Vemmenæs Peninsula, nearly 2 miles southeast of it, recedes about that distance in a southwest direction. The bay is nearly filled with shoal water, the shore bank extending about ⅝ mile from the northwest and southeast sides, and 1¼ miles from the head, leaving a space in its outer part, with from 3¾ to 4½ fathoms water, which affords anchorage over soft bottom.

Stenodde is bordered by a shore bank extending about ⅓ mile off, on its north and east sides, and nearly 1,200 yards eastward of it is a patch of 3¾ fathoms.

There is a pier at Vemmenæs with a depth of 9 feet alongside it. A dredged channel, with a depth of 9 feet, marked by spar buoys leads to the pier.

Bellbuoy and buoy.—A bellbuoy is moored northeastward of Stenodde, and close southwest of it is a red spar buoy, surmounted by an upturned broom, in a depth of 3 fathoms.

Langeland—West coast (continued from above).—From Næs Head, the west coast, trending in a southwest direction, for about 3¼ miles, to Rudkjöbing, rises gradually inland, is well built over, and has a number of hedges.

The most conspicuous objects are Tullebölle, Simmerbölle, and Rudkjöbing Churches, the first two having low towers, and the last a high spire. Hine Mill is the first mill eastward of Rudkjöbing, and close westward of it is a brewery, with a high chimney; about ½ mile northward of Rudkjöbing is a stone whitewashed, as a mark on the beach.

Between Langeland, on the east, and Turö and Vemmenæs Peninsula, on the west, the channel has depths of from 4 to 6 fathoms, the bottom being soft.

Rudkjöbing Channel, entered on the north between Middle Ground and Navers Ground is a narrow, crooked channel about 2 miles in length; it passes through to the southward, where its entrance is between Langeland and Strynö.

Middle Ground, with depths of from 1¼ to 2½ fathoms, is the outer shoal on the eastern side, and extends about 1½ miles from the Langeland coast, and southward of it Revbjerg Ground, with a few feet water, extending about a mile off the same.

Buoys.—A conical buoy, red and white in bands, is moored, in a depth of 4 fathoms, off the entrance to Rudkjöbing Channel, and close westward of the line of Siö leading lights.

A white spar buoy, surmounted by a straw wisp, is moored on Middle Ground, on the east side of the entrance.

Siö is a small low island on the west side of the channel; a farm is situated on the middle of the island, and a house on its southeast point.

Leading lights.—Two fixed white leading lights in line, bearing 182° and 330 yards apart, are exhibited at elevations of 29 and 19 feet from white posts on the northeast part of Siö; and two fixed red leading lights in line 200° and 208 yards apart, at 23 and 19 feet from white posts on the southeast point of the island, for the navigation of the channel.

Siö Sound, between Vemmenæs Peninsula and Siö, extends about 2 miles westward, with depths of from 1½ to 2½ fathoms, over sand, weeds, and rocks.

Ferry Pier.—On the north side of Siö Sound is a ferry pier, 820 feet in length, with a depth of 1 foot at its outer end; a ferry runs to Rudkjöbing.

Navers Ground extends about 1,200 yards southeast of the southeast point of Vemmenæs Peninsula, and Siö Ground stretches nearly 1 mile southward of the southeast point of Siö; the former has about ½ fathom and the latter 1 fathom on its extreme.

Bellbuoy.—The east extreme of Navers Ground is marked by a bellbuoy.

Channel—Depths.—Over Revbjerg Ground the channel is dredged for a distance of about 550 yards, and the least depth in

that part, northward of Rudkjöbing, is 12 feet, but southward the depth is 11 feet.

Buoyage.—The channel is marked by white spar buoys, surmounted by straw wisps on the east, and by red spar buoys with brooms on the west side.

Rudkjöbing Harbor is formed by two breakwaters, nearly 200 yards apart, and each about 600 feet in total length, the northern extending first northwest and then southwest and the southern northwest and north-northeast, the entrance between their heads, facing northwest, being about 60 feet. An arm extending northwest divides the harbor into two.

The depth in the northeast basin is 13 feet and in the southwest 12 feet, but winds between northwest and northeast raise the level 2 feet and those between south and southwest lower it 4 feet.

Lights.—Two fixed white leading lights, in line bearing 169°, and 275 yards apart, are exhibited at elevations of 36 and 19 feet from white posts situated northeastward of the church.

On the north breakwater head a fixed white lantern light, with a red sector, is shown at an elevation of 15 feet above high water, from a wooden pole 10 feet in height.

Two fixed red leading lights in line bearing 180° and 230 yards apart are shown, at elevations of 26 and 19 feet, from white posts near the harbor.

Two fixed green leading lights are shown, at elevations of 16 feet, from posts situated on the south breakwater; they are in line bearing 197°, and the front light has a white sector, which shows over the harbor.

Pilots can be obtained, and take vessels to Svendborg Sound and Marstal; the services of a tug are available, and there is a warping buoy.

Directions.—Five pairs of leading lights are shown from white posts for the navigation of the channel. The first pair, leading through the entrance to the channel, are fixed white and situated on the northeast part of Siö; they are in line, bearing about 206°, and having followed that line, two fixed red leading lights, northward of Rudkjöbing, will come in line about 168°.

When the third pair, fixed red, on the southeast point of Siö are in line, about 218°, they will lead to the line of the fourth pair, fixed red, on Rudkjöbing Harbor, about 180°, until the fifth pair, fixed green, and on the southwest breakwater, are in line 197°.

The buoys on either side will be a guide, but a pilot should be taken.

Tidal streams.—In settled weather there is a change in the direction of the tidal stream every six hours, but with unsettled conditions they may set in one direction for several days; when entering the

harbor care is necessary to guard against these streams, which set across the entrance.

Town.—Rudkjöbing, with a population of 3,537 in 1910, is the only town on Langeland and the birthplace of Örsted, the discoverer of electromagnetism.

Communication.—There is a service of steamers to Svendborg, and a road crosses the island to Spodsbjerg, where a steamer connects with Nakskov. The post office is near the harbor, and the telegraph office in the town.

Coal and supplies.—From 6,000 to 10,000 tons of coal are kept in stock; fresh provisions can be procured, and water is laid on the harbor.

Time signal.—A time signal is given at 1h. 0m. 0s. p. m., mid-European time, at the telegraph office daily. (See Chapter I.)

Submarine telegraph cables.—A cable crosses from the ferry pier, in Siö Sound, to Siö, and from the southeast point of Siö to Rudkjöbing. Two white telegraph posts on Siö and two on Taasinge, which are surmounted by triangles, mark the directions.

Coast.—The coast of Langeland, from Rudkjöbing, trends about south-southwest for 7 miles, and then turns west by north in a small peninsula, the extreme of which is Ristinge Tail. The first stretch of this coast is broken, about mid-distance, by Lindelse Nor, a fiord about 1½ miles in extent, with a depth of 9 feet in the entrance, and from 2 to 3 fathoms inside, but it is not much used.

The most conspicuous marks on this coast are Lindelse and Humble Churches, both white, the latter, the southern and higher of the two; Havbölle Mill lies between them. Hesselbjerg Mill is southwest of Humble Church, and southward of the former is Nordenbro Mill.

Depths offshore.—From Rudkjöbing to the north side of Lindelse Nor a shoal bank, with depths of from 1¼ to 1½ fathoms, connects this coast to the north side of Strynö, but southward the shore bank, to the depth of 2 fathoms, is generally about ⅓ mile from the shore; the space between this coast and Strynö has depths of from 2½ to 3½ fathoms.

Northward of Ristinge Peninsula the shore bank, with from ¼ fathom to 1 fathom water, extends about 1 mile, and is separated from Langö Sand by Ristinge Löb, which has a depth of about 6 feet.

Ristinge Pier, off Ristinge village, 1½ miles eastward of Ristinge Tail, is 100 feet in length, and has a depth of 8 feet at its outer end; it serves as a landing pier for vessels anchored in the road.

West side—Taasinge Ground.—The southeast side of Taasinge forms the northern part of the west side of this channel, the south point of that island being Vaarö Knude, and from this point to Siö this side of the island is fronted by Taasinge Ground, which, about

the middle, extends nearly 2 miles southeastward, its southern extreme being named Söndre Sæl Ground, ⅔ mile northeast of which is Nordre Sæl Ground, with a depth of 4 feet.

Strynö, southward of Taasinge Ground, is an island about 1¾ miles in length, in a north and south direction, and 1 mile in breadth; on its southwest side is Strynö Kalv, both islands being low. The island is well built over, the village and church being in the center; on the west side is a mill, and on the middle of the east side a pier and boat harbor.

Pier.—The pier is 625 feet in length, and has a depth of 1½ fathoms at its outer end; in the boat harbor the depth is 3 feet, but gales from northeast raise the level 4 feet, and those from southwest lower it 3 feet.

Buoy—Light.—The shore bank extends about ½ mile from the southeast and south sides of the island, and its south extreme is marked by a red spar buoy, surmounted by two brooms, in a depth of 2 fathoms.

Close to the spar buoy is a small bell buoy, in a depth of 1¾ fathoms.

A fixed white lantern light is shown from a pole situated north-northwest of the spar buoy.

Submarine telegraph cable.—A cable connects the island with Langeland, and is marked on the Strynö by two white telegraph posts, each surmounted by a triangle.

Langö Sand, which lies across the entrance between Ristinge Tail and Marstal at the east end of Æro, a distance of 2½ miles, has a general width of about ¾ mile and depths of from 1 foot to 1 fathom, over sand, weeds, and some rocks; three small islets lie on the sund, Storeholm, the eastern, forming the west side of Ristinge Channel, and the others being Langholm Head and Langholm, the latter on the east side of the channel which separates the sand from Marstal.

The space between Langö Sand and the bank on which Strynö lies is filled by the east edge of Meyers Ground, which has depths of from 1¼ to 2 fathoms.

Buoy.—A white spar buoy, surmounted by a straw wisp, is moored, in a depth of 1½ fathoms, eastward of Meyers Ground.

A red spar buoy with two upturned brooms is moored on the eastern part of Meyers Ground.

Beacons.—Two brown post beacons have been erected on Langholm, the western islet on Langö Sand. The front beacon, 11 feet high, has a circular brown-and-white horizontally striped top mark; the rear beacon, 20 feet high, has a diamond-shaped, brown-and-white horizontally striped top mark. These beacons in line lead through Klör Deep, the western entrance to Marstal from the southward.

Rudkjöbing South Channel.—The southern channel to Rudkjöbing passes close along the coast of Langeland, being entered about 1¾ miles northward of the entrance to Lindelse Nor; it has a depth of 11 feet.

Buoyage.—In the middle of the southern entrance is a red and white spar buoy surmounted by a ball.

A bell buoy is moored close to the spar buoy.

The east side of the channel is marked by white spar buoys surmounted by straw wisps and the west side by red spar buoys surmounted by brooms.

Fixed white lights are sometimes shown from three of these buoys.

Beacons.—Near the shore, southward of Rudkjöbing Harbor, are two day marks surmounted by diamonds, which in line bearing about 248° lead into the south channel, near the third spar buoy, from the entrance.

Great Belt—East side (continued from above).—Egholm, Agersö, and Omö are three islands lying about 2 miles off Stigsnæs, the southwest point of Sjælland, and occupy a space about 7 miles north and south; with the shoals that border their western side, they form the eastern side of the channel leading southward to Langelands Belt.

Egholm, the northernmost, is about ¾ mile in extent, low, and partially wooded on its north and northwest sides; it occupies the northern end of the same shallow bank on which Agersö stands.

Beacon.—A beacon, consisting of a white triangular framework, surmounted by pole and black ball, stands on the west side of Storskov, about 800 yards from the north point of the island.

Agersö, only separated by a distance of about 200 yards from Egholm, is 3½ miles in length in a north and south direction, with a general width of about 1 mile; it is flat at its north and south ends, but the middle part is 38 feet high.

Eastward of the middle of the island is Agersö town, 2 mills, and a low red church, with a small spire, but from the westward these are hidden by trees. With the exception of Agersö lund, a little grove near the west coast of the northern portion, the island is without trees; at the south end a narrow, flat isthmus stretches southeastward for about 1 mile, terminating in Helleholm, the extreme south end.

Lights.—Leading lights are exhibited from the southwest point of Agersö; they are fixed white, 250 yards apart, and in line, bearing 332°, being visible 4° on each side of this bearing.

The rear light is shown, at an elevation of 49 feet above high water, from a lamp-post, 49 feet in height, and visible 12 miles.

The front light, from the gable of a brown building 10 feet in height, at an elevation of 13 feet above high water, is visible 8 miles.

On Helleholm, a square white tower, 37 feet in height, with a gray lantern, exhibits, at an elevation of 39 feet above high water, a fixed light, with white, red, and green sectors, and the white and the red lights are visible 10 miles, and the green light 7 miles, but in various directions the light is obstructed by the land, for which and sectors, see Light List.

A fixed white light is shown, when the mail steamer is expected, from a position about 150 yards from the light.

Dangers.—A shoal flat fronts the west side of Ebholm and Agersö, extending about 1½ miles northwest, and ¾ mile westward of the former island, and the bank, with depths under 3 fathoms, also extends westward of Agersö for about 1¼ miles, with a tongue of the shoal stretching northwestward for a farther similar distance, its extremity being about 1¾ miles westward of the north end of Egholm.

A shoal, with a depth of 3½ fathoms over it, is situated 2½ miles northwest of Egholm.

For a distance of 2½ miles west by north of Næbet, the southwest point of Agersö, patches of from 2 to 4 fathoms extend to the 10-fathom contour line on the east side of the deep channel eastward of Vengeance Shoal; these patches also border the northern side of the deep channel leading to Omö Sound.

Omö, separated from Agersö by Omö Sound, is nearly 2½ miles in length in a northeast and opposite direction, and near its northern end is Skovbanke, a bare hill 77 feet high.

The lighthouse, with the church and mill eastward of it, are the most conspicuous objects.

Light.—On Langelands Öre, the west point of Omö, a cylindrical gray tower, 71 feet in height, with a white cupola, exhibits, at an elevation of 69 feet above high water, a fixed, flashing, and group flashing light, with white, red, and green sectors, which shows fixed white, fixed green, white double flashing, flashing red, and fixed red, between certain bearings, for which, see Light List. This light is visible 13 miles.

Dangers.—Omö Northwest Flats, consisting of foul ground, composed of sand and rocks, extends, with depths under 3 fathoms, for 1¼ miles northwest of Omö, and from Langelands Öre, the west point, a rocky reef with depths under 3 fathoms, stretches ½ mile westward.

Westward of Omö Northwest Flats and separated by depths of 10 fathoms, are some patches under 5½ fathoms, one with a depth of 4 fathoms, being 1⅞ miles west-northwest of Langelands Öre.

Omö Harbor, or Kirke Harbor, on the north side of the island, consists of a west breakwater, which extends for about 300 feet in a north-northwest direction, and divides into two arms at its head, one having an easterly direction for 130 feet and the other north-north-

west for a similar distance, the eastern breakwater, parallel to the inner part of the western, is about 250 feet, and the entrance, facing east, is 30 feet.

The depth in the entrance and in the harbor is 1½ fathoms, but northeast winds raise the level 4 feet and those from southwest lower it 4 feet. Some fresh provisions and water may be obtained, and the harbor is connected with the telephone system of the island.

Directions.—Steer about south for the high part of Omö, till Helleholm Mill is in line with the northeast point of the island, bearing 65°, which, used as a stern mark, leads to the entrance.

Omö Southwest Flats extends 1½ miles westward, and nearly 2 miles southwestward, of the south point of the island, to the 5-fathom contour line, and has a bottom of sand and rocks.

West side—Broen (The Bridge), extending from the northeast side of Hov Sand, in a northeast direction, for about 5½ miles, with Vengeance Shoal on its extreme, has general depths of from 4¼ to 9 fathoms, and several patches on its inner part, with from 3¼ to 4¾ fathoms, the bottom being sand and rocks, but rocky on the patches.

The least water is 3¼ fathoms 2¼ miles northeast of the coast of Langeland, and ½ mile westward of it is a narrow, crooked channel with a depth of 14 fathoms, not navigable for vessels; the outer shoal, with a depth of 4¼ fathoms, is 4 miles northeastward of the coast.

Vengeance Shoal, 1 mile in length in an east and west direction, and about 600 yards in width, within the 5-fathom contour line, is situated on the northeast end of Broen, and nearly in mid-channel of the Great Belt; it consists of several rocky shoals, with depths of from 3¼ to 4 fathoms, and is separated from the outermost patch of Broen by a channel 1,200 yards in width, with 6 fathoms least water in it, which is navigable for large vessels.

On the south and east sides Vengeance Shoal is comparatively steep-to, being about ¼ mile off the 10-fathom contour line of the deep channel, but northward of it, for a distance of 1⅔ miles, there are depths of from 5 to 9 fathoms.

Borreby Castle, in line with the north side of Agersö Lund, 83°. leads in not less than 5 fathoms north, and Helleholm Mill, just open south of Helleholm Lighthouse, leads south of Vengeance Shoal.

Buoy.—A red conical buoy is moored in a depth of 6 fathoms 200 yards southeastward of the easternmost shoal spot of Vengeance Shoal; the buoy is liable to break adrift.

Channel.—The deep channel from East Channel has a southerly direction, and about 2 miles north-northeast of Vengeance Shoal narrows to about the breadth of 1 mile, with depths of from 17 to 27 fathoms, and passes eastward of Vengeance Shoal, where its breadth is about ½ mile; it then trends in a south-southwest direction toward the northeast end of Langeland.

Directions.—For directions from Sprogö, eastward and westward of Vengeance Shoal, and through Langelands Belt to Kjelsnor, see end of chapter.

East side—Korsör to Skjelskör.—Southeastward of Korsör the land rises gradually to about 150 feet, and 1½ miles from Korsör is Korsör Wood, with Klar Wood nearly 1 mile farther on, both reaching to the coast. Several high, steep cliffs occur on this coast, Alehöj, the principal, being yellow, 46 feet high, and close to the sea northwest of Korsör Wood.

The most conspicuous objects are Bonderup Mansion House, the chief building of which is high and painted white; it stands to the northward of Klar Wood.

Boelsunde Church and Mill are very noticeable, and southwest of them is Espe Country Seat, from abreast which the coast trends to the southward and becomes lower. About 1½ miles southward of Espe is Espe Granplantage, a little pine wood, lying close to the shore, and from this the coast turns somewhat westward of south to the north entrance point to Skjelskör Fiord.

Depths offshore.—The 5-fathoms contour line is generally rather more than 1 mile from this coast, and runs close to that of 10 fathoms, outside which is a vien of deep water, from 200 to 1,000 yards in breadth, and with depths of from 16 to 22 fathoms, which continues through Agersö Sund.

From Alehöj the shore bank extends, in a southerly direction, to the 3-fathom contour line, for about ¾ mile, and southeast of this, off Klar Wood, is a detached patch, with 2¾ fathoms, ½ mile offshore; the bottom is sand and rocks.

Agersö Sound, the deep channel between Zealand, on the east, and Egholm and Agersö on the west, is the northern entrance to Smaalands Farvandet, and entered about 1½ miles off the Zealand coast, between the 10-fathom contour lines of Lindeskov Flat, on the east, and Egholm Flat on the west.

The general depths in the sound are from 12 to 35 fathoms, so that it is navigable for large vessels, but owing to the extensive shoals on either side, and the almost entire absence of buoys, it is only used by small vessels.

East side.—Lindeskov Flat extends for a distance of 1¼ miles from the shore southwest of Espe, to a depth of 3 fathoms; the northern part is foul ground, with several small shoals, and the bottom on the flat is sand and stones.

Gedehave Cliff, which is the south entrance point to Skjelskor Fiord, and the northwest extreme of Stigsnæs, is a steep, yellow cliff.

Leading lights.—Two fixed red leading lights are exhibited, at elevations of 16 feet and 13 feet above high water, from beacons

situated on the northeast side of the Gedehave; they are in line, bearing 158°, and are shown from August 1 to November 1.

Tudse Hook stretches 1,800 yards northwest of Gedehave, with depths under 4 fathoms; at 1,200 yards there is 2 fathoms water over it, and at 600 yards rocks dry at low water; the shoal is generally foul with rocks.

Skjelskör Roadstead, the bight formed between Lindeskov Flat and Tudse Hook, affords good anchorage in depths of from 3 to 4 fathoms with the east side of Stigsnæs Wood in line with the west side of Tudse Hook Cliff bearing about 157°.

Skjelskör Fiord, entered northward of Gedehave, extends about 1¼ miles in a southeast direction, and then turns northeast for about a similar distance to its head, where is Skjelskör town.

On the southeast side of the fiord is Borreby Castle, which is used as a leading mark.

Entrance—Depths.—Two stone breakwaters extend in a northwest direction from the entrance points, and the fiord will admit small vessels drawing about 13 feet water.

Buoyage.—A red spar buoy, surmounted by an upturned broom, is moored in a depth of 2 fathoms 500 yards from the west breakwater head.

The channel of the fiord is marked by red spar buoys, surmounted by brooms, on the south, and by white spar buoys, surmounted by straw wisps, on the north, according to the Danish system. (See Chapter I.)

Pilots have a station on the north side of the fiord, and they take vessels northward to Korsör and Nyborg, souward to Raagö Sound, and eastward to Masnedö.

Directions.—The two beacons on Gedehave by day, or the lights exhibited from them by night, bearing 158°, lead to the entrance, and the channel of the fiord must be navigated by the buoys, but a vessel should take a pilot.

Tidal streams.—The streams in the fiord are very strong, and in settled weather chang every six hours; but they are influenced by the body of water in the Nor, and sometimes attain a rate of 5 knots an hour.

Vasebro Pier, on the north side of the fiord, is 165 feet in length and has a depth of 10 feet at its outer end, but northerly gales raise the water 4 feet and those from the southward lower it 2 feet.

Skjelskör Harbor, wedge-shaped, for about 150 yards in a northeast direction, is about 200 yards in width at its entrance, narrowing gradually to its head. The quays are on the southeast side, and also a boat harbor.

The depth in the entrance channel is 13 feet, in the outer part of the harbor 14 feet, and in the inner portion and alongside the quays

from 10 to 12 feet, but winds between northwest and northeast raise the level 3 feet and those between southeast and southwest lower it 2 feet.

A tug may be obtained, and outside the harbor are four warping poles on the north and two on the south side.

Tidal streams.—The tidal streams change regularly exery six hours, and sometimes run strongly.

Town.—Skjelskör town, lies between the head of the fiord and the entrance to the Nor, a lake about 1½ miles in a north and south direction; Skjelskör Church, which is a conspicuous mark from seaward, has a square tower.

Communication.—There is a railway to Slagelse, the station being connected with the harbor, also a post, telegraph, and telephone office.

Coal and supplies.—About 15,000 tons of coal are usually kept in stock and good water from the waterworks is laid on the quays.

Coast.—From Gedehave the coast on the east side of Agersö Sound trends to the southward for 1½ miles to Örne Head, then turns to the southeast for a similar distance, and then more eastward, with a small bight of about 1 mile, to Ferne Cliff; Örne Head projecting west-northwest is almost covered by Stigsnæs or Örne Wood, and Ferne Cliff is a conspicuous yellow cliff 20 feet high.

In addition to Borreby Castle and Skjelskör Church, already mentioned, other landmarks are Magleby Church, painted white, eastward of Borreby Castle; Tjæreby Church, 1½ miles northeast of Magleby Church; and Hove Church and Mill, 6 miles inland, the former being painted white with a red roof.

Kopen.—Between Gedehave and Örne Head the shore bank, extending about ¾ mile off, is known as Kopen; it breaks down steeply from a depth of 3 fathoms to the deep channel.

Anchorage.—Kopen affords the best anchorage in Agersö Sound, the holding ground and protection being good, in a depth of 1½ fathoms, with Boeslunde Church in line with Tudse Hook Cliff bearing 21° and Magleby Church open north of Borreby Castle 93°.

Tærskelen extends ½ mile northwest of Örne Head, with less than 1 fathom water at 800 yards from that point, and westward of Örne Head is a large rock 400 yards from the point which is steep to the deep-water channel.

Southeast of Örne Head the shore bank extends about 600 yards, but off the bight westward of Ferne Cliff the shore bank, with depths under 3 fathoms, is nearly 1 mile off and close to the 10-fathom contour line.

West side.—Egholm Flat, the west side of which has been already noticed from the northeast side of that island, stretches 1 mile and

is close to the 10-fathom contour line; off the east side of the island it only extends about ¼ mile.

Bögevig, the bight formed between Egholm and Agersö, affords anchorage between the deep-water channel and the shore bank in depths of from 5 to 6 fathoms, or closer in; the shore bank is steep-to and about 400 yards inside the 10-fathom contour line.

Agersö Harbor, a boat harbor on the east coast of Agersö, and close to the town, is formed by two breakwaters, which have an easterly direction, for about 300 feet, the northern turning south for a farther distance of about 130 feet, with an entrance between the heads, facing south, and about 25 feet in width.

The depth in the harbor is 8 feet, but northeast winds raise the water 4 feet, while those from southwest lower it a similar amount. There is a telegraph and telephone office, and some provisions and water might be obtained in the town.

Österhoved Flat, between Agersö and Helleholm, extends fully 1 mile eastward of Österhoved, the east point of the former, and about the same northeast of the latter, there being a depth of 1¾ fathoms at that distance; the bottom of the flat is sand, with some rocks near the shore. On the east side of the flat is an indentation, with deeper water, known as Mölle Deep.

Buoy.—A red conical buoy, surmounted by an upturned broom, is moored, in a depth of 3½ fathoms, on the east side of the flat, and the north side of Mölle Deep.

Helleholm Flat, 1⅓ miles in breadth, stretching in a south-southeast direction, for about 2 miles from Helleholm, has depths of from 1½ to 2¾ fathoms, over sand and ooze, with rocks inside a depth of 1¾ fathoms.

Buoy.—A white can buoy, surmounted by two down-turned brooms, is moored, in a depth of 1¾ fathoms, on the middle of the flat.

Submarine telegraph cable.—A telegraph cable crosses from Agersö to Zealand.

Directions.—Coming from the northward, Skjelskör Church, ranging over Espe Granplantage, bearing between 118° and 113°, leads between Egholm Flat and the shoals off Zealand, and when the northeast end of Korsör Wood comes in line with the southwest end of Klar Wood, bearing about 351°, steering 171° with these as a stern mark, should lead between Tudse Hook and the shore bank east of Egholm.

When the two groves on Egholm are nearly touching, bearing about 321°, steer 141° with them as a stern mark, but showing a small opening between them, which course should lead between Helleholm Flat and the shore bank, southwest of Zealand, in not less than 5 fathoms water.

Omö.—Its light and western dangers have been described above.

Omö Sound, between Agersö and Omö, is the principal passage from the Great Belt to Smaalands Farvandet, and the depths in it being from 13 to 26 fathoms, it can be used by deep-draft vessels.

From its western entrance, about 2½ miles westward of Næbet, the southwest point of Agersö, between the 10-fathoms contour lines, inclosing the dangers westward of that island, on the north, and those extending northwest of Omö, on the south, it is about 7 miles in length, and is about 300 yards in breadth at its narrowest parts.

Submarine telegraph cable.—A cable crosses from near Helleholm to the east coast of Omö, the direction being marked on Omö by two white telegraph posts, each surmounted by a triangle.

North side—Dangers.—From Næbet a line of shoals, with depths of from 2 to 4¾ fathoms, and uneven bottom, extends for nearly 2½ miles in a west-northwest direction, and the shore bank along the southwest side of that island is narrow, but steep-to, breaking down from 1¾ fathoms to the deep channel in places.

At distances of ¾ mile and 1¼ miles westward of Næbet are patches of 3 and 2 fathoms, respectively.

South side.—Omö Northwest Flat forms the western part of the south side of Omö Sound, its 5-fathoms contour line extending 1¾ miles northwest of the north point of that island, with depths of from 1½ to 3 fathoms along its northern edge, and close to the 10-fathoms contour line of the south side of the sound.

From the north point of Omö a reef, with depths under 1 fathom, extends 800 yards in a north by east direction, and southeast of this, along the southwest side of the sound, is the northeast edge of a shoal, which extends for 1¼ miles southeast of Skov Cliff, on Omö with a patch of 5 fathoms, about 800 yards farther in the same direction.

Buoys.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 4½ fathoms, on the north side of Omö Northwest Flat, and on the south side of the sound.

A conical red buoy, surmounted by an upturned broom, is moored in from 10 to 11 fathoms water at the northeast end of Omö Reef.

On a line between these buoys there is not less than 3¼ fathoms.

Directions.—Entering Omö Sound from the westward, the north side of Helleholm Mill, just open south of the south side of Helleholm Lighthouse, bearing 102°, leads northward of Northwest Flat Buoy, in a depth of 5 fathoms, but care is necessary not to run southward of the line of these marks, which, being close together, do not show changes readily.

Having passed the buoy, steer along Agersö southwest coast, opening the mill somewhat of the lighthouse, and when the lamp post and

gable of a brown building on Næbet, from which the leading lights are shown, are in line, bearing 332°, steer 152°, using them as a stern mark; but this line leads close northeastward of the 5-fathoms patch already mentioned, and a better mark is a high tree between the two westernmost houses on Næbet, in line with a little round hill.

By night.—Approach the entrance in the fixed white sector of Omö light, between the bearings of 157° and 163°, until in the fixed white sector of Helleholm Light, between 102° and 104°, when steer for it until Næbet leading lights are in line 332°.

If from the southwest approach in the fixed white sector of Hov Light, between the bearings of 233° and 246°, until in Helleholm white sector.

Anchorage may be obtained on the east side of Omö, in depths of from 3 to 4 fathoms, from 400 to 600 yards from the land, and protected from winds between south-southwest around by west to north-northeast.

Langelands Belt, that portion of the Great Belt lying eastward of Langeland, is about 30 miles in length, from southward of Vengeance Shoal to Kjelsnor, and 6 miles in least width between Laaland and Langeland; but the shoals off the west end of the former island narrow the navigable width to about half that distance.

Depths.—The deep-water channel, which eastward of the north end of Langeland consists of two channels, unites into one abreast of Stoense, and for about 7 miles incloses a bank with depths under 10 fathoms, which extends nearly 3 miles off the Langeland coast.

Southward of Tranekjær the deep water closes the Langeland coast and runs along it from 1 mile to 1¾ miles on its western limit, with a least breadth of about ½ mile; the eastern limit of the deep water passes along the 5-fathoms contour line, inclosing the shoals on the Laaland coast, at a distance of about ⅔ mile on the north and 1¼ miles on the south sides.

Pilots can be obtained either at Slipshavn or at Albuen.

Current.—The currents in the middle of the Belt more or less follow the direction of the deep water and run strongest near the Langeland coast, usually following its direction; but the northerly current sets toward the coast between Kjelsnor and Spodsbjerg.

The current sometimes attains a velocity of 3 knots, and when it has considerable strength there is generally a counter current close to the land which is of advantage to small vessels.

Omö Tofte stretches for a distance of 3½ miles southward of Omö and within the 3-fathom contour line its general breadth is about ¾ mile; about its central part is a narrow ridge, 1,800 yards in length, with depths under 1 fathom, and between this and the south point of Omö is a channel with depths of from 1½ to 1¾ fathoms, used by small vessels.

A rock, 100 yards in extent and with 1 fathom least water, lies ¼ mile southeast of the south point of Omö; the bottom on part of Omö Tofte and in the channel is sand and rock.

Buoy.—A conical buoy, painted red and white in bands, and surmounted by a ball, is moored in a depth of 1½ fathoms on Omö Tofte and 1,600 yards southeast by south of Orespids.

Omö Staal Ground consists of two shoals, the northeastern lying southeast of the extreme of Omö Tofte and separated from it by a small channel, in which the depths are from 7 to 10 fathoms; it is about 2¼ miles in extent and has a least depth of 1¼ fathoms.

The southwest shoal, lying south-southwest of Omö Tofte, with a depth of 4¼ fathoms between, is 2¼ miles in length in a north-northwest and opposite direction and has a least depth of 1½ fathoms; both shoals have a bottom of sand, weeds, and some rocks and are surrounded by banks, on which are patches of from 3 to 4 fathoms.

Buoy.—A white can buoy surmounted by three down-turned brooms is moored in a depth of 2¼ fathoms near the south end of the southwest shoal.

Laaland—West coast.—The west coast of Laaland is low, flat, and wooded, and there are few conspicuous objects available as landmarks. From Onse Creek it curves round and trends south-southwest for about 5½ miles, and then turns to the southeastward, forming the north side of Nakskov Fiord.

The chimney of Tjörneby Farm is about 1 mile eastward of Onse Creek, and southward of it and further inland are Vindeby and Utterslev Churches, both white, while about 1¾ miles southwestward of the former is Kjöbelev Church, painted red.

Sandby Church, painted white, and having a pointed spire, is about 2 miles southwestward of Kjöbelev Church, and Nakskov Church, also red, and with a slender spire, and the very high chimney of a sugar factory, are both in the town of Nakskov, and conspicuous from all directions.

Albuen Peninsula, the north extreme of which is the south entrance point to Nakskov Fiord, is low, with a lighthouse and pilot house near its end, both visible from a considerable distance; nearly 5 miles southeast of these is Kappel Church, with a pointed tower.

Onse Creek, on the north side of the commencement of this coast, extends about 1 mile in a southerly direction, and is wooded on both sides.

The shore bank extends fully 2 miles off both sides of the entrance, and on the inner part of it, on the east side, is Spagesten, a large rock, drying at low water; the west side of the entrance is also foul, and a bank lies off the entrance.

Pier.—Onse Creek Pier, on the east side of the entrance to Onse Creek, extends in a west-northwest direction for about 950 feet and

has a depth of 5 feet at its outer end and 4 feet along the outer sides, but east winds raise and southwest to west winds lower the level, the difference between high and low water being 3 feet. There is a telephone, and some fresh provisions and water may be obtained.

Buoys.—On the end of the shore bank, on the west side of the entrance, a white can buoy, surmounted by a down-turned broom, is moored in a depth of 3¼ fathoms.

The channel in Onse Creek is marked by red spar buoys, surmounted by brooms on the west and white spar buoys with straw wisps on the east side.

Anchorage.—A channel passes on either side of the bank off the entrance and leads to a basin, with a depth of 2 fathoms, which affords well-sheltered anchorage to small craft.

Depths offshore.—Between Onse Creek and Taars, on the north side of the entrance to Nakskov Fiord, the shore bank to the 3-fathom contour line extends about 1½ miles off, the 5-fathom contour line being about 2¼ miles from the shore.

Vensholm, a small low island, is situated on the coast bank, about 2 miles southwest of Onse Creek, and southward of the island is Vensholm Sound, a narrow inlet with a depth of 2¾ fathoms.

Taars Creek, on the north side of the entrance to Nakskov Fiord, has depths of from 1¼ to 1½ fathoms; the anchorage in the road, well sheltered by the outside shoals, is in a depth of 2 fathoms.

A ferry pier on the north side of Taars Creek has a depth of 4 feet at its head, but the level is raised a similar amount by gales from north-northeast to east-southeast and lowered by those from southwest.

Submarine telegraph cables cross from Taars to Spodsbjerg.

Light.—On the east side of Taars Creek a gray tower, 20 feet in height, exhibits at an elevation of 20 feet above high water a flashing light, with white, red, and green sectors. The white light is visible 9 miles, the red light 8 miles, and the green light 6 miles. (For sectors, see Light List.)

Nakskov Fiord, between Taars East Point and Albuen Peninsula, a distance of 3 miles, maintains that breadth for a similar distance southeastward, and then turns eastward for about 2 miles to its head, where is Nakskov town; it is mostly shallow, but a narrow, winding channel runs through it to Nakskov.

The north side of the fiord, from Taars to Helnæs Point, a distance of 3 miles, has a general southeast direction, but is broken by several bays; from Helnæs it turns eastward for about 1½ miles to Nakskov. Sandby and Nakskov Churches are the most conspicuous objects on this side.

The outer part of the south side is formed by Albuen Peninsula, connected to Laaland by a narrow isthmus, eastward of which the

south side consists of embankments, which inclose the dry area fronting the points and bays on that side.

The most conspicuous objects on this side are Albuen Lighthouse, beacon, and pilot house. Langö Beacons, 1½ miles southeast of Albuen Lighthouse, Langö Mill, Kappel Church, Bogö Chimney, Store Vejlö Beacon, and Lille Vejlö Wood.

Enehöj, the largest island in the bay, is 51 feet high, and has a trigonometrical station on its summit, and eastward of it is Rommersholm, a small island, with Vejlö northeast of it; southward of Vejlö are Slotö, with the ruins of Engelsberg Castle and a farm on it; Dueholm, which is flat, while further east and southward of Helnæs, are Kuddeholm and Barneholm, and Trelholm still farther east.

Light.—On the extreme of Albuen Peninsula is a square white tower, 36 feet in height, with a gray roof, which exhibits, at an elevation of 36 feet above high water, a fixed light, with white, red, and green sectors. The white light is visible 11 miles, the red 10 miles, and the green light 9 miles. (For sectors, see Light List.)

Buoy.—A buoy marking a wreck with mast showing 10 feet above water, is moored 1½ miles, 270°, from the lighthouse.

Beacons.—The following beacons are situated in, or near, the fiord:

Enehöj Island.—Two beacons about the middle of the island and two at the south point.

Albuen.—A beacon 30 feet in height.

Rommersholm.—A beacon on the northeast point.

Vejlö.—Two beacons on the southwest side of the island, 200 yards southwest of the farmhouse; they are 150 yards apart, and in line, bearing 216°.

Dueholm.—A beacon on the south end of the island.

Langö.—Two beacons on the northwest end.

Store Vejlö.—A beacon on the west side.

Barneholm.—Two beacons on the west point.

Dangers—North side.—Björne Ground, situated to the southward of Taars, is small, and has a least depth of 3 feet.

Hvide Ground Flat, about 1¼ miles in breadth, extends for nearly 2 miles westward of Björne Ground to the 3-fathom contour line.

Buoys.—A red spar buoy, surmounted by an upturned broom, is moored, in a depth of 1¾ fathoms, on the north side of the flat.

A white spar buoy, surmounted by a straw wisp, is moored, in a depth of 3 fathoms, on the west side of the flat.

Hvide Ground, extending about ⅝ mile northwest of Enehöj, is about 1 mile in length, in a north and south direction, with depths of from 2 feet to 1 fathom, over a bottom of sand, rock, and seaweed; ½ mile westward of it the depth is 1¾ fathoms.

On the southwest side of the ground are two white spar buoys, the outer one with a wisp, and the inner with two wisps of straw; they are in a depth of 3 fathoms.

South side—Albu Triller, extending for about ⅓ mile northwestward of the north end of Albuen Peninsula, has a least depth of 2 feet over it.

Albu Flat extends 1½ miles westward of Albuen Peninsula to the 3-fathom contour line, the 5-fathom line being 2¼ miles offshore.

Buoys.—The west side of Albu Flat is marked by a white can buoy surmounted by three down-turned brooms, in a depth of 6½ fathoms and 2.6 miles westward of the peninsula.

A red spar buoy surmounted by an upturned broom is moored in a depth of 4 fathoms northwest of Albu Triller.

Ryggen consists of two sand banks lying about 1,200 yards north-northeastward of Albuen, with 1¼ fathoms on the eastern and 1½ fathoms on the western; the 3-fathom contour line is fully 1 mile northwest of the western shoal.

Buoys.—The northwest side of the flat on which Ryggen lies is marked by a red spar buoy surmounted by two upturned brooms, and the edge of the bank eastward of it is marked by three similar buoys, the two outer with one broom and the innermost with two brooms.

Albu Roadstead, the fairway inside Ryggen, has depths of from 2 to 3 fathoms, and affords at its entrance anchorage over clay, with sand and seaweed; the shore bank off Albuen is quite clean.

Albu Harbor, inside Albuen, has a depth of 1¼ fathoms, but as there is not more than 1 fathom in the entrance 200 yards eastward of Albuen it is only suitable for small craft or boats.

Albuen Pier, on the north side of Albuen, has about 4 feet at its end, but northeast winds raise the level 2 feet and those from southwest lower it about 3 feet. There is a telephone station on Albuen.

Channel—Depths.—The channel is entered between Hvide Ground Flat and the shoal extending northward of Ryggen, and trending southeast passes close southward of Enehöj; it then turns northeast, between Vejlö and Slotö, and resumes its southeast trend, turning eastward to Nakskov; the depths in the channel are from 2¾ to 3 fathoms. A channel with a depth of 1 fathom trends southward of Dueholm.

Buoyage.—The channel is marked on its port side by white spar buoys surmounted by wisps of straw, and on the starboard side by red spar buoys surmounted by upturned brooms.

Pilots for the fiord can be obtained at Albuen, and will take vessels to Korsör or Nyborg and to Raagö Sound, Skjelle Reef, and Masnedö. A small steam vessel acts as a tug.

Langö Harbor, situated on the south side of Nakskov Fiord, has the entrance channel marked by spar buoys.

Directions.—The two large pilot houses on Albuen in line lead northward of Albu Triller, and Enehöj beacons in line bearing 117° lead between Hvide Ground Flat and the shoal north of Ryggen, and to the line of Langö beacons in one, after which the channel must be navigated by the buoys.

Anchorages.—There is anchorage, protected from all winds, in Albu Roadstead, in a depth of 2½ fathoms, with the north end of Lille Vejlö Wood in line with the south point of Enehöj, bearing 109°, and the west end of Langö in line with the east end of Albuen Peninsula 168°.

Eastward of Enehöj, in a depth of 3 fathoms, close off the farm on the island.

In Helnæs Roadstead, the channel northeast of Slotö, in from 2½ to 2¾ fathoms; this is a good anchorage, with swinging room, for vessels not intending to proceed to Nakskov.

Tidal streams.—In settled weather the tidal streams turn every six hours, running in the direction of the channel, and being strongest off Enehöj.

Ice.—Average ice conditions, see Appendix.

Nakskov Harbor extends in an east-southeast direction for a distance of about 900 yards with widths of from 70 to 150 yards.

The depths in the channel, which runs through the harbor to a quay on the north side, below where a bridge crosses it, are 2¾ fathoms, but gales between northeast and east raise the level 3 feet, and those from southwest to west lower it by the same amount.

Town.—Nakskov, a town with a population of 8,386, is the terminus of the railway to Nykjöbing, and has a large sugar refinery; its church, with a slender spire, has been already mentioned as a conspicuous mark.

Communication.—There is a regular service by a small steam vessel to Spodsbjerg, and railway communication with Nykjöbing, and with Bandholm and Rödby via Maribo; the post and telegraph offices are in the town, about ½ mile from the harbor, and a telephone connects the harbor with Albuen.

Coal and supplies.—A coal store is capable of storing 15,000 tons of coal. Fresh provisions are plentiful, and the water from the town waterworks is laid on the quay.

Trade.—Agricultural produce is the chief export, and coal and feeding stuffs are imported; beer is made, and there are iron foundries and sawmills.

Submarine telegraph cable.—A cable crosses from Langö to about 800 yards eastward of the pilot houses on Albuen.

Langeland—East coast.—The east coast of Langeland, from the northeast extreme of the islands, trends almost in a straight line for 27 miles, in a south-southwest direction, to Kjelsnor, and is high, hilly, and wooded in many places.

Northward of Tranekjær, or for the first 10 miles, the most conspicuous objects are Skiften Mill, Hov Chapel, Stensgaard Mill, Stoense, Snöde, and Böstrup churches, all colored white, Svalebölle Mill, Tranekjær Castle and Church, and lastly Nedergaard large principal building, painted red and surrounded by woods northeast of Svalebölle Mill.

Southward of Tranekjær are Tullebölle Church and Mill, nearly 2 miles northwest of Spodsbjerg; the former has a square tower, but neither are seen except from the southeastward.

Longelse Church, painted white, and partly hidden by trees, is 1¼ miles southwest of Spodsbjerg, and Longelse northern mill is westward of the church, while the southern is eastward of Fuglsbölle Church, which has a slender spire, but is only seen on certain bearings.

Farther south are Illebölle and Lindelse Mills, and southeast of the former is Polleholm brickworks, with a conspicuous chimney, Lindelse, Humble, and Fodslette churches, as well as the large red principal building of Skovsgaard, which has a pointed tower, are only visible from some directions.

Hjortholm Farm, about 2 miles eastward of Humble Church, is large, and has a mill among the farm buildings, and Tryggelev Church and Mill, nearly 3 miles southwest of Hjortholm, are all conspicuous from the southeastward.

Magleby Church, near the south end of Langeland, is white, and has a slender, dark tower, and northward and southward of it are Nordenbro and Söndenbro Mills, which, with Kjelsnor Lighthouse, all form marks.

Fakkebjerg, a rounded grassy hill 120 feet high, about 1 mile northwestward of the lighthouse, is bare of trees, and, being the highest point in the vicinity, is easily recognized.

Hov is situated about 1¼ miles south-southeast of the north extreme of Langeland, and Hov Sand and Broen have already been described.

Light.—A red circular tower, 38 feet in height, situated at Hov, exhibits, at an elevation of 39 feet above high water, a fixed, flashing, and group flashing light with white and red sectors, and the light is visible from a distance of 11 miles. (For sectors, see Light List.)

Depths offshore.—Except in some few places the coast bank, to the 3-fathom contour line, along this stretch of coast is narrow, and the 5-fathom contour line is from ⅓ to ⅔ mile off. The bottom is of sand, with rocks in places.

Tetens Ground, with a depth of 1¾ fathoms, lies ½ mile offshore, abreast of Stoense, and 2¾ miles southward of Hov. It is a patch of rocks lying on the extension of the shore bank, and has a channel with depths of from 2½ to 2¾ fathoms between it and the coast.

Snode Reef, 1,400 yards southward of Tetens Ground, is rocky, with 1 to 1¼ fathoms over it, and extends 600 yards offshore.

Tranekjær.—About 9½ miles south by west of Hov the coast forms a slightly rounded projection, on which is a lighthouse with a conspicuous chimney close northwest of it.

Light.—A square white tower, 29 feet in height, with a gray roof, standing on Tranekjær, exhibits, at an elevation of 45 feet above high water, a group flashing white light; it is visible 12 miles.

Fog signal.—During thick or foggy weather a fog siren gives a blast of three seconds' duration every minute.

Sandhage, a sandy shoal, with depths under 1 fathom, extends 600 yards from the coast ¼ mile northward of Tranekjær Lighthouse.

Spodsbjerg Ferry Pier, 3½ miles south-southwest of Tranekjær, extends 230 feet in a southeast direction, and then east for a similar distance; from the angle an arm extends 130 feet southwest.

The depth at the extreme is 11 feet, and along the southern side of the outer part from 9 to 10½ feet, the southwest arm having the same depths on its seaward side. Gales from northwest through north to east raise the water 4 feet, those between south and west lowering it by the same amount.

Light.—A fixed red light is exhibited, at an elevation of 22 feet above high water, from a gray post 18 feet in height on the end of the ferry pier from August 20 to October 20.

Communication.—There is a daily steamer to Nakskov, which takes mails, and the nearest post and telegraph offices on Langeland are at Rudkjöbing, about 6 miles distant.

Submarine telegraph cable.—A cable crosses Langelands Belt from Spodsbierg Ferry pier to near Taars Ferry pier; its direction is indicated on Langeland by two white telegraph posts, surmounted by triangles.

Nebbe Revler, about 1½ miles south-southwest of Spodsbierg Ferry pier, consists of a number of sandy shoals, with depths of from 1 foot to 3 feet; they extend about ½ mile off and break down steeply to the 5-fathom contour line.

Similar sandy shoals lie along the coast southward of Nebbe Revler, and outside them the bottom is even, the 5-fathom contour line being about ½ mile offshore.

Kielsnor is situated 13 miles south-southwest of Spodsbierg Ferry pier, on the southeast side of the south extreme of Langeland.

Light.—A white square tower, 111 feet in height, and standing on the low sandy beach at Kielsnor, exhibits, at an elevation of

128 feet above high water, a group flashing white light visible 17 miles.

Fog signal.—A fog siren gives a double blast every minute, thus: Blast, about 2 seconds; silence, about 3 seconds; blast, about 2 seconds; silence, 53 seconds.

Ice signals and signals regarding withdrawal of lightvessels are shown from a house immediately southward of Kielsnor Lighthouse. (See Chapter I.)

Shoal.—A shoal, with a depth of 3 fathoms, lies about 1,200 yards southward of the lighthouse.

Directions—From Sprogö through Langelands Belt.—The following directions from East or West Channel, eastward or westward of Vengeance Shoal, and through Langelands Belt to Kielsnor, are continued from preceding pages.

East of Vengeance Shoal.—A deep draft vessel coming from East Channel, and having passed Halskov Reef light and whistle buoy, should steer 177°, until Sprogö Lighthouse bears 320°, and then alter course to 142°, bringing the lighthouse astern, bearing 322°, until Korsör Castle is nearly in line with Korsör Church, keeping to the westward to bring them in line, bearing 10°.

Steering 190°, with Korsör Castle and Church in line as a stern mark, when the wooded northwest point of Egholm is in line with Boeslunde Church, bearing 48°, keep to the westward to bring the church well inside the north point of the island, bearing 46°, and steering 226° with these as a stern mark, should lead ½ mile eastward of Vengeance Shoal buoy. These marks are said to be difficult to make out.

Continue the course until Omö Lighthouse bears about 125°, and then alter course to 200°, which, if made good, should lead through Langelands Belt, passing Kielsnor Lighthouse at a distance of 2 miles, taking care to avoid the shoals off Nakskov Fiord.

From the southward, and being about 2 miles eastward of Kielsnor Lighthouse, a 20° course, for a distance of 29 miles, should lead through Langelands Belt, and with Omö Lighthouse north, bearing 125°, alter course to 46° and steer for Boeslunde Church, showing well inside the wooded northwest point of Egholm, bearing 46°, which should lead ½ mile southeastward of Vengeance Shoal Buoy.

Vessels over 30 feet draft should, when Omö Lighthouse bears 145°, edge to the northward and steer for Korsör Church and castle in line, bearing 10°, and when Sprogö Lighthouse bears about 324°, alter course so as to steer for it, 322°, which course should be followed until Halskov Light Buoy bears north, when steer to pass westward of it.

Vessels under 30 feet draft should have Omö Lighthouse bearing 151°, and then keep more to the northward, so as to have it

astern, bearing 157°, and steer 337°, until the light buoy bears north, proceeding as above.

Note.—In the event of the lightbuoy not being sighted the vessel's position should be carefully ascertained by bearings, or angles, of Knud Head, Sprogö, and Halskov Lighthouses, and a course through the deep channel shaped accordingly.

By night.—From the northward, and being westward of Halskov Reef Light and whistlebuoy, steer 177°, until Sprogö Light bears about 320°, bringing it to bear 322°, and steering 142°, with it astern, until Halskov Light bears 9°, when it should be brought to bear 7°, and a 187° course shaped with it astern.

When Hov Light (double white flashing) bears 230°, keep more to the westward and bring that light ahead, bearing 233°, which is on the line between the flashing double white and fixed white sector, and when Omö Light bears about 125° (double white flashing), keep more to the southward, and steer 200°, which course will lead through Langelands Belt in not less than 7 fathoms, and 2 miles eastward of Kielsnor Light.

From the southward, if from Kiel, steer to pass Kielsnor Light at a distance of 2½ miles, or if from Fehmarn Belt, shape course about 297°, direct for it, and after passing it, the Langeland coast should not be approached too closely, until Albuen Light is sighted; as the red sector of this light will be made, it is not easily distinguished, especially in thick weather.

Being in the deep channel eastward of Kielsnor Light, and with Albuen Light bearing about 39°, a 16° course should be shaped, and a bearing of Tranekjær Light, if it is seen in time, should lead westward of the shoals extending from Albuen, and having Tranekjær Light abeam, alter course 24°, keeping well outside the 5-fathom contour line off the Langeland coast.

When Hov Light (flashing red) is abeam, distant about 3 miles, steer 20° until Omö Light bears 125°, when alter course to 46°, keeping in the fixed white sector of Hov Light.

Vessels over 30 feet draft should, when Omö Light bears 145°, and changes to double flashing white, keep to the northward, and steer for Halskov Light, bearing 7°, until Sprogö Light bears about 324°, when it should be steered for on that bearing, and when Halskov Light and whistle buoy bears north, steer to pass westward of it.

Vessels under 30 feet draft should, when Omö Light bears 151°, keep to the northward, bringing it astern, bearing 157°, and steer 337°, keeping on the line between the fixed white and double flashing white sectors, until Halskov Reef Lightbuoy bears north, when proceed as above. See Note above.

From the north, keep in the fixed white sector of Omö Light, working toward its western edge, until Hov Light changes from

double flashing white to fixed white, when keep to the westward, remaining in the fixed white sector of Hov Light, and altering course to the southward, when well clear of the shoals westward of Omö.

From the southward vessels should keep in the fixed white sector of Hov Light, working toward its northern limit, and when Omö Light changes from flashing red to double flashing white edge gradually to the northward, and on Omö Light becoming fixed white immediately leave the fixed white sector of Hov Light for its double flashing white sector, and steer northward as convenient, remaining in the fixed white sector of Omö Light.

West of Vengeance Shoal.—Steer about 170° from position westward of Halskov Lightbuoy until the easternmost chimney at Korsör and Korsör Church are in line, bearing 22°, and steer 202°, with these as a stern mark, but as this line only passes a short distance northwest of the 5-fathom patch northward of the west end of Vengeance Shoal, when nearing the latter the chimney should be brought just open westward of the church, bearing 23°.

The 203° course should be continued until the southern edges of Troldehoved and Apages woods on Zealand are shut in to the southward of the wooded northwest extreme of Egholm, bearing about 57°, and when Omö Lighthouse bears 128° change course to 178° and continue this course until Hov Lighthouse bears 263° when alter course to 200°, which leads through Langelands Belt, as stated above.

From the southward these directions require to be reversed, but as a stranger would experience difficulty in recognizing the leading mark at a distance of over 9 miles, it would be advisable not to use this channel, from this direction, without local knowledge.

Note.—To avoid a mistake occurring regarding Korsör Church and castle tower, both being square and painted red, it should be remembered that the castle tower is the broader of the two, and should be seen to the westward of the church, when on the leading line above given.

By night.—The channel west of Vengeance Sound is not recommended for vessels exceding 24 feet draft, by night. A southerly course should be steered from East Channel until the double flashing white sector of Hov Light is seen, when steer for it, bearing 212°, keeping just inside the northern limit of its sector of visibility.

When the fixed white sector of Omö Light is entered, edge gradually to the southeastward, and steer for Omö Light, bearing 133°, and after entering the fixed white sector of Hov Light, alter course through Langelands Belt.

From the southward, reverse these directions.

Caution.—Vessels of deep draft require to use great caution when using the channel on either side of Vengeance Shoal, and especially

by night, as the compass has to be greatly depended on, and in passing eastward of the shoal, on a single bearing of Halskov Light, using it at a distance of more than 8 miles, even a slight error in bearing might lead into danger.

Anchorage may be obtained with westerly winds everywhere off the east coast of Langeland, but the strong current and swell, which almost invariably accompanies a fresh breeze, renders it uncomfortable. Small vessels find anchorage on the Laaland coast at Onse Creek, Taars, and Nakskov Fiord.

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CHAPTER VIII.

SMAALANDS FARVANDET.

Smaalands Farvandet, the channel which lies between Zealand, on the north, and Laaland and Falster, on the south side, connects the Great Belt with the Baltic by Guldborg Sound, Grön Sound, and Böge Ström; it is about 40 miles in length and 9 miles in greatest width between Stigsnæs and Vejrö.

Its western boundary consists of an imaginary line from Korsör Church, touching the west sides of Egholm, Agersö, and Omö, from which latter it is continued to Onse Creek; the eastern limit varies according to the various channels, being a line from Sandene to Böge Ström buoys, for Böge Ström; Tolken, the shoals at the eastern entrance to Grön Sound for that channel, and a line from Flinthorne Reef to Skjelby for Guldborg Sound.

The principal entrances from the westward are through Agersö or Omö Sounds, and through the channel between Omö Staal Ground and the northwest end of Laaland, but the latter is not suitable for large vessels.

Depths.—Agersö and Omö are both deep, and the channel southward of Omö Staal Ground has a depth of about 4 fathoms; within these entrances, for a distance of about 15 miles eastward, Smaalands Farvandet has general depths of from 6 to 10 fathoms, but is divided by a line of shoals extending for a distance of about 9 miles in a west-northwest direction, from Knudshoved, a narrow peninsula stretching in a similar direction, and for about the same distance from Zealand.

Of the eastern entrances to Smaalands Farvandet, Böge Ström will admit of vessels of from 7 to 8 feet draft; Grön Sound, owing to a number of sand banks which encumber its mouth, has a greatest depth of 12 feet, and in Guldborg Sound, southward of Nykjöbing, the depths are from 7 to 8 feet.

Tidal streams.—During fine and settled weather the tidal streams set regularly, the flood to the eastward and the ebb to the westward, but should the weather become unsettled they depend upon the direction of the wind; those winds which cause a northgoing stream in the Belts give a westgoing stream in this channel, and a stream in an opposite direction being the result of winds giving a southgoing stream in the Belts.

In the small channels at the eastern end the tidal streams sometimes attain a rate of from 3 to 4 knots, but in the western portion they seldom exceed 1 knot.

Zealand shore.—Ferne Cliff, a small, yellow, but conspicuous cliff, has been already described, and for a distance of about 6½ miles eastward of it a shallow lagoon, with depths under 3 feet and an average breadth of about 1 mile, lies immediately behind the coast line; the western portion of this lagoon is named Basnæs nor, and the eastern Holsteinborg nor, after mansion houses on the north shore.

The coast separating the lagoon from Smaalands Farvandet consists of Sevedo fed, a narrow strip of land extending eastward from Stigsnæs, and eastward of this Glænö Island, with Glænö Vester and Öster feds. Glænö has steep, yellow cliffs 86 feet high on its seaward side, and northeastward of it lies Ormö, a small wooded island, which is conspicuous.

The lagoon has two entrances, the western between Sevedo fed and Glænö Vester fed has a depth of 7 feet, and the eastern between Glænö Öster fed and the land extending from Bisserup has 3 feet.

From Bisserup the coast trends in an east-southeast direction for nearly 6 miles to Karrebæksminde.

Skjelskör, Höve, Tjæreby, and Magleby Churches and the principal buildings of Basnæs mansion house, which latter has a small red tower but is partly hidden by trees, are conspicuous, as also are Örslev Church, with a white, jagged gable, Snedinge and Rude Mills, and Holsteinborg Castle, which has two slender, dark towers.

Eastward of Holsteinborg Castle is a stretch of wood along the shore to Bisserup loading place, and 2 miles east of Bisserup is Gumperup Cliff, 95 feet high and close to the shore. Farther eastward are Karrebækstorp Wood and Karrebæk and Karrebæksminde Villages, while inland are Taarnmark and Menstrup Mills, Karrebæk Church, with a white tower, and Karrebæk and Karrebæksminde Mills, all on high ground, are conspicuous from seaward.

Depths offshore.—On this stretch of coast the 5-fathoms contour line is generally about ¾ mile off, with several patches of from 4¼ to 4¾ fathoms outside it; the shore bank, to the 3-fathom contour line, is nearly 1½ miles off abreast of Glænö Vester fed and Bisserup, and otherwise is distant about ¾ mile; the bottom is sand, with stones in places.

Dangers.—A shoal, of sand and stones, with a depth of 3½ fathoms over it, lies 1½ miles southward of Ferne Cliff, and about the same distance southward of Sevedo fed is a shoal of 3 fathoms; a rock, on which the depth is 2 feet, lies 800 yards southwest of Sevedo fed. There are other detached patches in this locality, which will be seen on the chart.

Bisserup Road.—Anchorage may be obtained on both sides of the shore bank, extending 1½ miles southward of Bisserup, that on the west being named Bisserup West Road and that on the east Bisserup East Road.

West Road, between this shore bank and that extending southeast of Glænö, has a depth of 3 fathoms, but a rocky shoal, with a depth of ¾ fathom, lies on the bank off the southeast side of the island.

East Road has a similar anchoring depth at ¼ mile from the point near Bisserup, but the sand bank on the east side has depths under 1¾ fathoms.

Directions.—If proceeding to Bisserup West Road, which is generally used, except with winds between South and West, Taarnmark mill kept in line with the west side of the high houses at Bisserup, bearing about 33°, leads in, and for East Road, the spires of Holsteinborg Castle should be just open southwest of the point at Bisserup, 318°.

Karrebæk Fiord, leading to Næstved, extends about 2½ miles northeast and then curves around by southeast to north-northeast, Næstved being about 7 miles from the entrance.

Karrebæk Road, the space between the shore banks on either side of the entrance to Karrebæksminde, has a depth of over 4 fathoms within 600 yards of the coast.

Directions.—To enter Karrebæk Road, Karrebæk Church should be kept in line with the east side of the first cliff northwest of Karrebæksminde, until the north edge of Lönned wood comes on with the harbor mole, near Karrebæksminde, when anchorage may be taken up in 4 fathoms water, over good holding ground, but on-shore winds set in some sea.

Karrebæk Harbor, the harbor of Næstved, and the only one on this part of the coast, is formed by two breakwaters, the northern about 650 feet in length in a southwest direction, and the southern about the same length, west-southwest bending northwest for about 500 feet to its head, between which and the northern breakwater, is an entrance, open westward, and 130 feet in width. A middle mole extends in a west-southwest direction from the north side of the entrance to the canal.

The entrance to the outer basin has a depth of 19 feet, and in the harbor and alongside the middle mole is a depth of 15¾ feet; from this a dredged canal, nearly 900 yards in length, and with a least depth of 8 feet, communicates with Karrebæk Fiord, and small vessels drawing 6 feet water can proceed to Næstved.

Northerly winds raise the level about 4 feet, while those from the southward and eastward lower it about 3 feet.

Light.—A fixed white and red lantern light is exhibited, at an elevation of 16 feet above high water, from the northwest corner of

the middle mole, between August 1 and May 1, and the line between the white and red lights, bearing about 94°, leads nearly in mid-channel into the harbor.

Buoyage.—The channel to Næstved is marked on the starboard hand by poles surmounted by brooms, and on the port hand by the same but with straw wisps.

Pilots for the harbor take vessels to Næstved, north to Korsör and Nyborg, south to Gulborg, and east to Grön Sound. There are two warping buoys outside the harbor, and tugs may be procured from Næstved.

Tidal streams.—During settled weather the tidal streams run for six hours each way; with the flood stream the water rises for the first three and falls for the last three hours, and with the ebb, it falls for the first three and rises for the last three hours. The streams sometimes set strongly through the harbor.

Nestved, a town with a population of 7,944 in 1909, is about 2 miles from the head of the fiord, and has some fine beech woods. Karrebæksminde has about 300 inhabitants.

Communication.—Nestved has railway communication with Copenhagen, and with Gjedser by a ferry which crosses from Masnedö to Orehoved. There is a post and telegraph office at Karrebæk Harbor.

Coal and supplies.—From 4,000 to 5,000 tons of coal are stocked, and fresh provisions may be procured, and water at Karrebæk Harbor.

Coast.—From Karrebæksminde the coast trends in a southeast direction for 10 miles to the head of Agnö Fiord, the first 4 miles being formed by Enö and Dybsö Islands, within which is Dybsö Fiord, the coast southward of it being Svinö land, a peninsula, 60 feet high, on its western side.

Knudshoved, a narrow peninsula, nearly 8 miles in length in a west by north direction, forms the south side of Agnö Fiord; about 2 miles from the extreme of Knudshoved is Draget, a very narrow, low isthmus, covered at extreme high water, which connects the eastern cultivated with the western uncultivated part, and westward of Draget the land has some steep hillocks, separated by level flats.

The most conspicuous marks to the eastward of Dybsö Fiord are Vester Egesborg Church, red, with a jagged gable; Hammer Church, white, and lying high; and Kjöng Church, with a sharp spire.

The south coast of Knudshoved Peninsula trends in a southeast direction for about 11 miles to Masnedö, an island lying little more than 200 yards off the coast, and connected to it by a railway bridge;

about 1 mile northward is Rosenfeld, a large mansion house, the principal building of which has a little, slender tower.

Ore Lighthouse is about 1 mile southwest of Rosenfeld, and 1½ miles eastward of the lighthouse is the town of Vordingborg, the church of which is painted red; Valdemars Tower, high, red, and with a pointed roof, is close southeastward of the church.

Blaabjerg, a very conspicuous wooded hill, about 3½ miles northeast of Vordingborg, may be seen from the westward or eastward, and Kulsbjerge, consisting of several hills, the highest 348 feet, and once a trigonometrical station, is situated 3 miles eastward of Vordingborg.

Depths offshore.—The shore bank to the 3-fathoms contour line, and the 5-fathoms contour, are about 1 mile and 1½ miles, respectively, from the coast of the islands fronting Dybsö Fiord, but farther southeast Agnö Fiord is almost filled with shoal water. The shore bank, along the north side of Knudshoved Peninsula, as far as Draget, is steep-to, with some large rocks inside the 1-fathom contour line.

Enö West Flat, with depths under 1¾ fathoms, extends for a distance of 800 yards westward of Enö.

Dybsö Harbor is the entrance to Dybsö Fiord, between Dybsö and Svinö land; a stony flat and a bar, on which the depths are from 3 to 4 feet, prevent it from being used by anything but small vessels.

Agnö Fiord, from abreast Dybsö Harbor, where it is about 2½ miles in width, to its head, is about 6 miles in length, and gradually narrows; Agnö Peninsula extends for about ¾ mile from the coast on its northside, and about 2 miles within its entrance is Agnö rön, a small island in the middle of the fiord, with rocky reefs extending from its northwest and southeast ends.

A channel, with depths of from 1½ to 3¼ fathoms, runs along the south side of the fiord, southward of the island.

From a little eastward of Draget to the extreme of Knudshoved Peninsula, a narrow tongue of shoal water, with depths of from ¾ fathom to 2¾ fathoms, extends parallel to and about ¾ mile off the north side of the peninsula.

Knudshoved Reef extends 2 miles in a west-northwest direction to the 5-fathom contour line from the extreme of Knudshoved; for ⅔ mile from the extreme of the peninsula it is a reef, with several rocks on it, and depths under 2 fathoms, and from this to the outer end of Knudshoved Reef lie several rocky patches, with deep water between them.

About ½ mile westward of the end of Knudshoved Reef is a detached patch, with 1¾ fathoms water over it, lying on a bank about ¾ mile in length, within the 5-fathom contour line.

Buoy.—A white can buoy, surmounted by a downturned broom, is moored in a depth of 3 fathoms, 1⅜ miles west-northwest of the extreme of Knudshoved Peninsula.

Vene Ground consists of several patches of sand and stones, separated by small channels, with depths of from 3 to 4 fathoms; the northern shoal, about 2¼ miles in length in a west-northwest and opposite direction, has a least depth of 1 fathom toward its east end.

The southwest patch, about 1 mile in extent, has a least depth of 2 feet, which lies 4¾ miles westward of the extreme of Knudshoved; the southeast patch has a least depth of ¾ fathom.

A patch, with a depth of 3½ fathoms, lies 1 mile northeast of the west end of the northern shoal; the bottom of Vene Ground is sand and rocks.

Buoys.—The northeast side of Vene Ground is marked by a conical red buoy, surmounted by an upturned broom, moored in a depth of 5¼ fathoms.

A white can buoy, surmounted by three down-turned brooms, is moored in a depth of 4¾ fathoms on the south side of the southwest shoal of Vene Ground.

Kirke Ground, lying about 4¾ miles southward of Basnæs Nor, and separated from Vene Ground by a channel 2 miles in width, with depths of from 4 to 7 fathoms, covers a space about 2 miles in length, in an east and west direction, and 1¼ miles in width within the depths of 5 fathoms, the bottom consisting of sand, stones, and weeds.

On the southern patch is a depth of half a fathom; the northern patches have depths of 2¾ fathoms; a patch of 2¼ fathoms lies about 800 yards eastward of the shoalest part, and in the channel between Kirke Ground and Vene Ground is a patch of 3¼ fathoms.

The southern and eastern sides of the shoal are steep-to, rendering it dangerous on those sides.

Bell Buoy.—A white can bell buoy, surmounted by two downturned brooms, is moored, in a depth of 5¼ fathoms, close southward of Kirke Ground.

Anchorage may be obtained in Agnö Fiord in a depth of 2¼ fathoms, with the highest part of Kulsbjerge, in line with Kastrup church, bearing 111°, or, with southerly winds, on the shore bank northward of Knudshoved.

Directions.—From the northwestward Verjö Lighthouse should not bear westward of 170°, which leads westward of Kirke Ground, in a depth of 4 fathoms. Boeslunde and Magleby Churches, in line, bearing 338°, leads between Vene and Kirke Grounds.

Holsteinborg Castle spire, in line with the northeast point of Ormö, 3°, leads, in a depth of 4 fathoms, 400 yards westward of the southwest patch of Vene Ground.

The western end of Knudshoved, bearing 85°, leads southward of Vene Ground, in a depth of 7 fathoms.

To pass eastward of Vene Ground leave the buoy off the end of Knudshoved Reef close to the eastward, avoiding the 1¾-fathom patch westward of that buoy.

By night the lights of Agersö, Omö, and Vejrö will be good guides, and the northern fixed white sector of Omö Light, bearing 280°, leads northward of Kirke and Vene Grounds, and the southern fixed white sector, 303°, leads between Kirke Ground and Vene Ground on the north, and the shoals extending from the north side of Vejrö on the south side.

The fixed white sector of Vejrö Light, bearing 277°, and used as a stern mark, steering 97°, leads into the fixed white sector of Ore Light, between the bearings of 90° and 95°, if proceeding toward Masnedö.

A fixed white sector from Vejrö, between the bearings of 198° and 215°, leads between Kirke Ground and Vene Ground.

Gun practice is carried out occasionally in an area westward of an imaginary line drawn in a northerly direction from the west end of Knudshoved as far west as a line north and south through the bellbuoy marking Kirke Ground; when firing takes place by night, the area is lighted by searchlights.

Laaland—North coast.—The north coast of Laaland, from Onse Vik trends to the eastward for about 6 miles to Ravnholt Hook, and then turns southeast for nearly 10 miles to Bandholm; it then resumes its easterly direction for 4½ miles to the entrance to Saxkjöbing.

The western portion of this coast is low and wooded. Kragenæs Point, about 4 miles southeastward of Ravnholt Hook, is rounded, with Kragenæs Harbor, near its central part, and southeastward of this the land becomes higher and more hilly, several hills being wooded.

The most conspicuous objects are Ravnsby Mill, southward of Kragenæs, and 5½ miles southeast of it is Svanevig Mill. Bandholm Church, painted red, and having a tall, slender spire, may be seen from nearly all parts of Smaalands Farvandet, and 3½ miles westward of Bandholm Church is Stokkemarke Church.

Depths offshore.—The 3-fathom contour line is generally about 2 miles off until abreast of Ravnholt Hook, where a prong stretches to the northward for 3¾ miles, forming the western side of the entrance to Staal Deep; from this to the entrance to Saxkjöbing the coast is fronted by several islands, the principal being Raagö and Raagö Kalv, Feiö, Lilleö, and Askö. Ravnholt Hook, consisting of sand and rocks, has a depth of 2 fathoms at 1,600 yards offshore; the channel between it and Middle Ground is marked by buoys.

Raagö and Raagö Kalv, connected at low water, lie about 1¼ miles northeastward of Urne wood; Raagö is flat, nearly circular, ½ mile in diameter, and covered with sedges and bushes. The island is inhabited and has a pilot's lookout on it, which is conspicuous. Raagö Kalv is low, entirely flat, and is uninhabited.

These islands lie on a bank, about 2 miles in length, in a northwest and opposite direction, and are separated from the Laaland coast by a channel, known as Raagö Sund, in which there is a depth of 1¾ fathoms.

Pilots reside on Raagö and pilot vessels amongst the islands, besides taking them north to Korsör and Nyholm, west to Turö Reef, south to Albuen, and east to Vordingborg, Masnedö, and Guldborg.

Raagö Flat, extending from abreast Urne Wood, stretches 3½ miles, in a northwest direction, from Raagö Kalv, and for nearly 1 mile has depths under 1 fathom, and a depth of 4 fathoms about 3¼ miles from the same island; it extends 600 yards from the east sides of the islands, and is steep-to along the southwest side of Staal Deep.

Flyndersand extends 900 yards southeast of Raagö, and consists of sand, while on the western side of the islands is Middle Ground, with a depth of 1¼ fathoms, 1,400 yards from them.

Buoys.—The northeast end of Raagö Flat is marked by a red spar buoy, surmounted by an upturned broom; it is moored in 1 fathom water.

A white spar buoy, surmounted by a wisp of straw, is moored in a depth of 1½ fathoms, southwest of Middle Ground.

The south extreme of Flyndersand is marked by a white spar buoy, surmounted by a wisp of straw; it is moored in 1½ fathoms water.

Pier.—A pier, 1,250 feet in length, and 180 feet in breadth at its head, extends in a northeast direction from Urne Wood; it is approached by a channel 50 feet in width, which has a depth of 10 feet, there being the same alongside its outer end.

Kragenæs Öre, the shore bank extending in a north-northeast direction from Kragenæs, has a depth of 2 fathoms at 1,200 yards offshore, and on its inner part are rocks.

Buoy.—The northeast side of Kragenæs Öre is marked by a red spar buoy, surmounted by an upturned broom; it is moored in 2 fathoms water.

Kragenæs Harbor, about 200 yards in length and ¼ cable in greatest width, is formed by two moles extending in an easterly direction, with an entrance facing eastward about 40 feet in width; it is approached by a dredged channel, in which and through the middle of the harbor are depths of 2 fathoms.

Light.—A fixed red light is exhibited, at an elevation of 20 feet above high water, from a black pole, 16 feet in height, on the north mole head; it is shown from September 1 to April 30.

Beacons.—A beacon is situated at the head of the harbor, and there is one farther westward; when in line they lead through the dredged channel into the harbor.

Anchorage.—There is good, well-sheltered anchorage off Kragenæs Harbor in depths of from 2 to 2¼ fathoms, ½ mile off the shore, over a bottom of clay, with weeds in places.

Communication.—The nearest post office is at Horslunde, but there is a telephone at the harbor; a ferryboat runs to Fejö.

Coal and supplies.—A small quantity of coal and supplies of fresh provisions and water can be procured, the latter from an artesian well.

Repairs.—Small repairs can be executed.

Submarine telegraph cable.—A cable crosses to Fejö, and is marked on that island by two white telegraph beacons.

Kellernæs Hook, a flat, nearly 1 mile in breadth at its narrowest part, extends from the coast 3½ miles southeast of Kragenæs, and has depths under ½ fathom over it; its northeast end is steep-to on the south side of Staal Deep.

Lindholm, lying on the northeast end of Kellernæs Hook, is a moderately high island, with some parts wooded.

A bank extends for about 1½ miles in a west-northwest direction from Lindholm, and near its extreme, and 1 mile from the island is Stenhejlm, a large rock, on which the depth is 4 feet.

Beacons.—Two beacons, used as leading marks for the channel to Bandholm, are situated on the northeast end of Lindholm.

Lindholm Reef extends 400 yards, in a northerly direction, from the northeast point of Lindholm; it is composed of sand, gravel, and rocks, and from a depth of 2 feet breaks down steeply to 8 fathoms.

Light.—A fixed white light is shown from a post on the reef about 300 yards northward from the east extreme of the island.

Buoys.—A red spar buoy, surmounted by an upturned broom, is moored, in a depth of 1¾ fathoms, northward of Stenhejlm.

A similar buoy marks the northeast side of Lindholm Reef, and is moored in 1¼ fathoms.

Bank.—The shore bank, southeastward of Lindholm, to Saxkjöbing Fiord, is broad, the 1-fathom contour line being ¾ mile offshore; on this shore bank is Hollænder Ground, with a rock, on which the depth is 1 fathom, 1 mile from the shore.

Bandholm Harbor, situated immediately southeast of the above bank, is formed by two moles, about 1,150 feet in length, in a northeast direction, the northern having a short arm extending east-southeast, and the southern one extending north, the entrance between these heads being 160 feet in width, and facing east. The railway runs on to the north mole, and there is a crane which will lift 5 tons. There is an electric coal crane and two grain elevators at the new quay.

The depths in the entrance and in the harbor are 14 feet, but gales from northwest to northeast raise the level 3 feet, and those from southeast to southwest lower it 2 feet. Bandholm Channel, the channel of approach, is dredged to a depth of 19 feet, and there is a depth of 19 feet at new quays.

Light.—A fixed red light is exhibited from a post on the north mole, between October 1 and March 1.

Leading lights.—Two fixed green leading lights are shown in the harbor from posts. They are 172 yards apart and in line when bearing 238°. Visible from 214° through west to 281°, shown from October 1 to March 1.

Two fixed white leading lights are shown at elevations of 26 and 16 feet, from poles 13 feet in height, situated near the harbor, and are in line, bearing 201°. They are exhibited from September 1 to April 1.

Buoyage.—A conical black buoy is moored in 2 fathoms water, on the east side of the channel, at the entrance to that part leading to Bandholm Harbor.

Bandholm Channel is marked by red spar buoys surmounted by brooms on the starboard and by white spar buoys with straw wisps on the port hand.

Pilots may be obtained at Raagö or at Fæmö.

Directions.—The two leading light poles near the harbor, by day, and the fixed white lights by night, when in line bearing 201°, lead through the dredged channel. The outer pole is surmounted by a white triangle apex pointing upward. When the fixed green light posts are in line, bearing 238°, they lead eastward of Havneö to the harbor.

Tidal streams.—The rise and fall is about 1 foot, and in settled weather the streams change every six hours.

Town.—The town is situated near the harbor.

Communication.—There is a railway to Maribo Junction from which lines run to Nakskov, Rödby, and Nykjöbing. The station is in the town. The post, telegraph, and telephone offices are near the harbor.

Repairs.—There is a patent slip, capable of taking vessels up to 150 tons. Repairs to wooden vessels can be effected.

Coal and supplies.—About 20,000 tons of coal are kept in stock; fresh provisions may be procured, and water from a spring near the harbor is plentiful and good. On the new quay there is an electric coal crane capable of discharging or loading vessels at the rate of 50 tons an hour.

Water can be obtained from a water boat equipped with centrifugal pumps.

Submarine telegraph cable.—A cable crosses from Reersnæs Nakke to the south side of Askö, its direction being marked on Askö by two telegraph posts surmounted by a triangle.

Saxkjöbing Fiord.—Stensöre, a peninsula about 1¼ miles wide, extends in a northwest direction and forms the northeast side of Saxkjöbing Fiord, and from Bandholm Channel the channel to Bandholm to abreast of the extreme of Stensöre is about ⅔ mile in width, with depths of from 1½ to 3 fathoms.

From between Korsöre and the extreme of Stensöre the channel has a southeast direction for 1½ miles to Oreby, the depth being from 1½ to 2 fathoms; it then continues in the same direction for 2 miles, with a depth of 1½ fathoms, to Saxkjöbing.

Oreby Pier, on the northeast side of the channel to Saxkjöbing, is a broad mole, about 200 feet in width at its extreme.

The depths near the pier are 10 feet, but winds from northeast raise the level about 2 feet, and those from east, through south to west, lower it about 3 feet.

Pilots may be obtained at Oreby, and there are warping buoys off the pierhead.

Tidal streams.—The tidal streams sometimes run with considerable velocity.

Saxkjöbing Harbor is approached by a dredged channel 2 miles in length from Oreby, the depths in the channel and in the harbor being 10 feet, but winds between north and northwest raise the level about 2 feet, while those from south to southeast lower by the same amount. The harbor has been recently enlarged.

Buoyage.—The southwest side of the channel is marked by 14 red spar buoys with brooms, and the northeast side by white spar buoys with straw wisps.

Directions.—Having passed the entrance to Bandholm Channel a southeasterly course may be steered, passing southward of the buoys marking Skovsand, and when the east end of Kragenæs Wood is in line with the low part of Lindholm, bearing about 304°, it should be used as a stern mark, which will lead to the entrance of the dredged channel.

Town.—Saxkjöbing town had a population of 1,575 in 1907, and its church, with a slender spire, is conspicuous.

Communication.—Saxkjöbing has railway communication by the line which joins Maribo and Nykjöbing, the station being about ⅓ mile from the harbor, and the post and telegraph offices about half that distance.

Coal and supplies.—A small quantity of coal and fresh provi-provisions and good water may be obtained.

Islands and shoals.—Stensöre Peninsula is wooded in places; its northern point is named Rödsnæs. The most conspicuous objects are

Oreby Farm House, painted red, with two slender spires, of which the northern is the higher; Taars Church, about 1½ miles eastward of Oreby Farm House, is painted white.

Askö, a low, flat island, is situated 3 miles northwest of Stensöre; on its north side is the village and church, white, and surrounded by trees; and on the northeast side a mill.

Pier.—Near the western part of the south side of the island is a pier, 720 feet in length, with a depth of 1 fathom at its extreme.

Lights.—Two fixed white leading lights in line lead up to the pier. The rear light is situated about 200 yards eastward of the pier, the front light on the pier. The rear light is shown from October 1 to March 1 from dusk to 9 p. m.; the front light is shown all night from September 1 to March 1.

Submarine telegraph cable.—A cable connects Askö with Reersnæs Nakke.

Lilleö, lying northward of Askö, and connected to it by a flat on which the depth is less than 3 feet, is low, flat, and inhabited.

Fejö, situated 2 miles northwest of Lilleö, and abreast Kragenæs, is irregular in shape, about 3¾ miles in length in an east and west direction, and 3 miles in width; it is somewhat flat, without woods, and is closely built over.

On its southeast side is Dybvig Bight, a bight in which is Dybvig Harbor, lying between Fejö Sletter or Sletteren, the southeast point, and Avernakke, the south point, which latter is a low, flat tongue.

Skovnakke and Draget are the eastern and western points, respectively, on the north side.

The most conspicuous objects are Österby and Vesterby Mills, and Fejö Church, white, with a sharp spire, which lies in the south part of the island, near the east coast.

Dybvig Harbor, on the southeast side of Fejö, is formed by two breakwaters, about 300 feet in length in a southerly direction, the entrance between their heads, facing south, being about 130 feet in width.

The depths in the entrance are about 1½ fathoms, and in the harbor from 1¼ to 2¼ fathoms, but northeast winds raise the level about 4 feet and those from southwest lower it 3 feet.

Lights.—On the end of the west breakwater a fixed white light is exhibited, at an elevation of 9 feet above high water, from a wooden shed; it is shown from September 1 to April 1.

Two fixed white leading lights are shown when the harbor is open, at elevations of 22 and 11 feet above high water, from a position eastward of Fejö Church, and are 170 yards apart and in line bearing 330°; they are shown from October 1 to April 1 until 9 p. m.

Two fixed red leading lights in line lead through the dredged channel to the harbor. The front light is situated on the west mole

northward of the white light. The rear light is shown from a white beacon. The lights are shown from August 1 to April 1.

Buoys.—The starboard side of the dredged channel is marked by spar buoys with brooms.

Pilots may be obtained from Raagö, Fæmö, and Bandholm.

Directions.—The white leading lights in line lead in a depth of 1½ fathoms westward of the shoal extending westward of Askö and through Lindholm Deep.

The leading mark through the channel by day is the west corner of the mill open eastward of the white beacon mentioned above.

Communication—Supplies.—A small mail steamer calls regularly and there is a steam ferry to Kragenæs; post, telegraph, and telephone offices are about ½ mile distant. Fresh provisions and water may be obtained.

Ferry Pier.—The steam ferry pier is on the southwest side of the island.

Skalö, about ¾ mile in extent, lies off the northwest end of Fejö, and is connected to it by a causeway; there are few houses on the island.

Skalö Harbor, a small harbor for fishing boats, is on the south side of Skalö and has a depth of about 3 feet.

Submarine telegraph cable.—A cable connects the north point of Skalö with the south point of Vejrö.

Vejrö, lying near the extreme of the line of shoals which extends nearly 15 miles northwest of Stensöre, is about 1½ miles in length in an east-northeast and opposite direction and nearly ½ mile in width; it is low and much built over.

Light.—A hexagonal-shaped white tower, 52 feet in height, standing on the northeast point of the island, exhibits, at an elevation of 62 feet above high water, a fixed flashing and group flashing light with white, red, and green sectors; it shows white fixed, white flashing, white double flashing, red fixed, and green fixed, and is visible 13 miles. (For sectors and duration of flashes and eclipses, see Light List.)

Shoals.—The shoals surrounding the chain of islands, extending northwest from Stensöre, of which Vejrö is the outermost, and which form the east side of Staal Deep, and the channel leading to Saxkjöbing Fiord will now be described.

Skovsand, extending from Stensöre with a breadth of nearly 2 miles, terminates in two spits of sand, with depths under one fathom, leaving a very narrow channel between it and Askö. On its southwest side, Skovsand breaks down steeply to 2 and 3 fathoms.

Buoys.—The southwest sides of three shoals are marked by white spar buoys, surmounted by straw wisps, the buoys being moored in a depth of 1¾ fathoms.

Konemads Hook, a rocky shoal, extends 800 yards from the southwest point of Askö, and at 400 yards from the point is a rock that dries.

Buoys.—A conical black buoy is moored in a depth of 1¾ fathoms, southward of Konemads Hook, and the west side of the same shoal is marked by a white spar buoy, surmounted by a straw wisp, in a depth of 2 fathoms.

Middle Ground.—Between Lilleö and Fejö Sletter is Middle Ground, extending ½ mile in a north and south direction, with depths of from 2 feet to 1 fathom; there is a channel with 1¼ fathoms between it and Fejö Sletter. The north end of Middle Ground is marked by a white spar buoy, surmounted by a straw wisp.

Fejö Sletter Reef, a rocky reef, extends for 400 yards in a southeast direction from Fejö Sletter, and has depths under 1 fathom.

On the southeast side of Fejö the shore bank, to the 2-fathoms contour line, is 800 yards off-shore. A red spar buoy, surmounted by an upturned broom, is moored in 1¼ fathoms, southeast of Fejö Sletter Reef.

Light.—A fixed white light is shown from a post on the southeast end of the reef.

Avernakke Hook, composed of sand and rocks, extends 1,200 yards southwest of Avenakke, the south point of Fejö, to the 2-fathom contour line.

On the west side of Fejö and Skalö the shore bank is narrow and steep to Staal Deep.

Buoy.—A spar buoy, painted red and white in bands, and surmounted by a broom over a straw wisp, is moored in a depth of 2 fathoms, southward of Avernakke Hook.

Shoals northward of Skalö.—A chain of shoals connects Skalö and Vejrö, Skalö Ground, the southernmost part, extending 1½ miles northward of Skalö, and Raagö Nebbe Ground, westward of it, 1 mile to the 1-fathom contour line; both shoals are rocky.

Fejö Staal Ground from its southern end, which is 600 yards northward of Raagö Nebbe Ground, stretches 1½ miles in a north-northwest direction, with depths under 1 fathom, and continues in the same direction for a similar distance in a tongue, which at 4½ miles from Skalö has a depth of 2½ fathoms; between this tongue and Vejrö is a deep vein of water, with from 3 to 6 fathoms.

From Skalö to its northwest extreme the whole of this shoal is steep-to on the side of Staal Deep.

Buoys.—A white spar buoy, surmounted by a broom, is moored, in a depth of 2 fathoms, on the west side of Fejö Staal Ground, and a red spar buoy surmounted by a broom, upturned, is moored in the same depth northward of that shoal.

Skallebakken stretches about 2 miles northwest from Fejö, and then a similar distance northeast, having a depth of 1 foot at low water; the extreme end of the shoal is about 4 miles north-northeast of Skovnakke.

Between Skallebakken and Skalö Ground is a deep vein, with from 4 to 5 fathoms.

Valle Ground.—Vejrö is surrounded by shoal water, and from its south point Valle Ground, with depths under 1 fathom, extends ⅜ mile in a south-southwest direction; it is composed of light sand and the discolored water shows. A white spar buoy surmounted by a wisp of straw is moored in a depth of 2 fathoms southward of Valle Ground.

Vejrö West Flat, extending from the west side of Vejrö, is about 2¼ miles in breadth, and its southwest extreme is 1½ miles westward of the south point of the island, the northwest end of the shoal being 2¼ miles west-northwest of the lighthouse. The general depths over it are from 1¼ to 2¼ fathoms, but near the southwest extreme is a patch of ¾ fathom, and a similar spot lies 1½ miles westward of the lighthouse.

Buoys.—A white spar buoy, surmounted by a straw wisp, is moored in a depth of 2 fathoms off the southwest point of the shoal.

A conical red buoy surmounted by an upturned broom is moored in 3 fathoms 500 yards northward of a 1¼-fathom patch near the north side of the shoal.

Vejrö Southeast Flat extends about 1½ miles southeast of the island, and on it is a patch of 1¼ fathoms; it is separated from Fejö Staal Ground by a channel, with from 3 to 4 fathoms water.

Buoy.—The northwest side of the 1¼-fathom patch is marked by a red spar buoy surmounted by an upturned broom; it is in 2 fathoms.

Staal Deep, the channel between the shore bank extending from Laaland on the southwest and Fejö Staal Ground, Skalö, and Fejö on the northeast side has a general width of about ⅓ mile between the banks on either side, which are mostly steep-to.

Depths.—The depths in the channel are from 5¼ to 9 fathoms, except a patch of 3½ fathoms, with 7 fathoms on either side of it, which lies nearly in mid-channel northeastward of the buoy marking Raagö Flat.

Fairway buoy.—A conical red and white striped buoy, surmounted by a ball, is moored in a depth of 7 fathoms at the north end of the channel.

Directions.—Vesterby Mill, on Fejö, bearing 135°, leads to the fairway buoy, and when nearing the buoy marking Raagö Flat, which lies with Ravnholt Wood seen over Raagö Kalv, the course should be more to the southward toward Bandholm Church until

Avernakke Hook is passed, which should be at a distance of about 400 yards, with the west side of Skalö open westward of Fejö, about 336°.

When Fæmö Mill is open south of Fejö Sletter, bearing about 51°, the vessel will be south of Avernakke Hook and in Lindholm Channel, and the course should be altered to 100° for Askö Church until Raagö is just open westward of Avernakke, 315°, which, used as a stern mark and steering 135°, will lead between the buoys marking Lindholm Reef and Konemada Hook; having passed Lindholm, steering a little easward of Bandholm Church will lead to the entrance to Bandholm Channel.

The least depth in this latter part should be about 2½ fathoms, and the banks on each side being steep, the bottom light colored, and the tidal streams showing ripples over them, they can generally be seen.

There are several channels between the islands of the chain already described, which are used by small vessels having local knowledge, but, as a stranger would be unlikely to use them, and in the event of doing so would require to employ the services of a pilot, no directions are given.

Vigs Ness, about 3 miles eastward of Stensöre, is a peninsula extending about 2½ miles in a northwest direction, and forms the western entrance point to Guldborg Sound and the east point of Taars Bay, which recedes about 1½ miles and has depths of from 1½ to 2 fathoms in the outer part, but the inner portion is filled by the shore bank. Vigsnæs Church, with a sharp spire, and Vigs Ness Mill are conspicuous.

Beacon.—A beacon, 40 feet in height, surmounted by a triangle pointing downwards, stands on Vigs Ness Peninsula.

Vigsö—Beacon.—Vigsö, a narrow island, about 1,200 yards in length, in a west-southwest and opposite direction, lies close northwest of the extreme of Vigs Ness, and has a beacon, surmounted by a ball, near its central part.

Fæmö, lying 4¼ miles northwest of Vigsö, is 2½ miles in length, in a northwest and opposite direction, and about 1¾ miles in width; it is hilly, and near its southeast end is Issemisse Hill, 65 feet in height, and a trigonometrical station; Fæmö Sletter, the south point of the island is small and narrow, and the west extreme of the island is named Darre Point.

The most conspicuous objects are Fæmö Church, with a sharp spire, and Fæmö Mill, both on the west side of the island.

Fæmö Harbor, on the west side of the island near the church, is small, and formed by a mole, extending about 150 feet southeast, from the west end of which a breakwater stretches southwest and southeast, in each case for about a similar distance, and then turns north-

east, to its head, between which and the mole is the entrance, facing southeast, and about 100 feet in width.

The depth in the entrance is 1¼ fathoms, and slightly less in the harbor, but northerly winds raise the level about 2 feet, while those from the opposite direction lower it by the same amount.

Lights.—From a brown pole, 10 feet in height, on the south angle of the breakwater, a fixed white light is exhibited, at an elevation of 14 feet above high water; it is shown from August 1 to June 1.

Two fixed white lights are shown from posts southeastward of the harbor which in line lead through the dredged channel. The lights are shown from September 15 to April 1.

Buoys.—The southern starboard side of the channel is marked by red spar buoys the outer of which carries a broom. The depth in the dredged channel is 10 feet.

Pilots may be obtained; they live about 1 mile from the harbor. There is a post, a telegraph, and a telephone office on the island.

Directions.—Fæmö Mill, in line with the middle of the trees southward of the church, bearing about 93°, leads to the entrance.

Submarine telegraph cable.—A cable connects the east side of Fejö and the west side of Fæmö; its direction is marked on both islands by two white telegraph poles, each surmounted by a triangle.

Shoals.—Hiulsand, a flat about 2 miles in breadth, on which Vigsö lies, fronts the extreme of Vigs Ness, extending about ⅔ mile, with a depth under 1 fathom.

Vigsö Flat, with Vigsö Skal, the northwest continuation of Hjulsand, stretches 2¼ miles in a northwest direction, from the extreme of Vigs Ness, within the depth of 4 fathoms; the bottom is sand and stones.

Stemme Tofte, from its east end, 1¼ miles westward of Vigsö, extends for 1¾ miles in a northwest direction, curving to the northward, and, with the exception of a rock which dries near its southeast end, it is composed of sand and stones and has depths of from 1 foot to 4 feet.

It is separated from Vigsö Flat by a channel, with depths of from 3½ to 5¼ fathoms, and between it and Askö is a broad channel, with from 1½ to 2¾ fathoms water.

A red spar buoy, surmounted by an upturned broom, is moored in a depth of 2 fathoms northwest of Stemme Tofte.

Fæmö Sletter Reef, extending about 1,800 yards in a southerly direction from Fæmö Sletter, with a breadth of 600 yards, has depths of from 2 feet to 1 fathom.

On the southwest side of Fæmö the shore bank does not extend more than about ¼ mile, and northward of the harbor it is only about 200 yards off.

A white spar buoy, surmounted by a straw wisp, is moored in a depth of 1¾ fathoms southward of Fæmö Sletter Reef.

Darrehöj Flat stretches westward from Darrè Point for a distance of 1,200 yards, with depths under 2 fathoms; at 400 yards from the land the depths are 1 fathom.

Northwest of Darre Point the flat extends 1½ miles, where the depth is 2¾ fathoms, the 5-fathom contour line being 2½ miles northwest of the point. A white spar buoy, surmounted by a straw wisp, is moored in 1¾ fathoms water about 1,200 yards westward of Darre Point.

Stenöre Nakke, a reef composed of sand and rocks, with depths under 1 fathom, extends for a distance of ½ mile from the north point of Fæmö; at 1,400 yards off there are depths of from 4 to 5 fathoms.

Skjelle Reef, which, to a depth of 4 fathoms, stretches eastward for fully 2 miles from the east point of Fæmö, has on it a narrow sand ridge ½ mile in length that dries and is frequented by birds and seals. Between the ridge and the island is a channel for small vessels.

Buoy.—A red spar buoy, surmounted by two upturned brooms, is moored eastward of the point of Skjelle Reef in a depth of 3¼ fathoms.

Fæmö Sound, the channel between Fejö and Fæmö, is entered from the northward between Skalle Bakken and the northwest flat of Fæmö, where the depths are from 5 to 7 fathoms. Above the telegraph cable the bottom is uneven, and the channel can not be used by vessels drawing more than 10 feet water.

Anchorage.—The usual anchorage in Fæmö Sound is in a depth of 2½ fathoms, with Fæmö Mill in line with the trees southward of Fæmö Church, bearing 93°, and the road to Norreby Village open.

Directions.—A vessel from the northward should pass about 1 mile eastward of the east point of Vejrö and bring the west side of Nielstrup Wood (not charted) in line with the east point of Lilleö bearing about 165°, which will lead in a depth of 2½ fathoms 300 yards eastward of the shore bank from Fejö, and to abreast of Fejö Sletter Reef, after which the water shoals and a pilot is necessary.

Guldborg Sound, separating Laaland from Falster, is approached between Skjelle Reef and Ko Ground, and entered between Vigsö and Vigs Ness on the west and Suderö and the west coast of Falster on the east.

Nykjöbing, the principal port for shipping, can be reached by vessels of less than 20 feet draft from the northward, and those of 8 feet draft can enter from the southward.

Vigs Ness Peninsula, on the west side of the entrance, has been already mentioned. Its church, mill, and beacon are conspicuous.

Guldborg is situated about 4 miles southeast of Vigs Ness, and westward of it the land is thickly wooded. Majbölle Church, high, painted red, and with the general form of tower, is 2 miles southward of Guldborg, and farther west Taars Church may be seen.

The northwest coast of Falster, on the east side, is generally low and wooded in parts.

The most conspicuous objects on this side are Vaalse Church, painted red, with a sharp spire; Kippinge Church, with a slender spire; Northern Vedby and Northern Alslev Churches, the former red and the latter white, are the ordinary form of village church.

Dangers.—Skjelle Reef and Hiulsand, dangers on the west side of the approach, have been described.

Vigsö Skal, a small rocky shoal, with a depth of 1½ fathoms, lies northward of Hiulsand, separated from it by a channel with a depth of 1¾ fathoms.

About 1 mile northwest of Vigsö Skal are some detached rocky shoals, the northern with 1½ and the southern with 2½ fathoms.

Buoys.—The northern side of the 1½-fathoms shoal is marked by a red spar buoy surmounted by two upturned brooms, moored in 3¾ fathoms water.

A red spar buoy surmounted by an upturned broom is moored in a depth of 2 fathoms northeast of Vigsö Skal.

Argus Ground consists of two small rocky shoals lying 1½ miles eastward of Vigsö and ½ mile from each other; the northwest shoal has a depth of 1½ fathoms and the southeast 1¾ fathoms.

A red spar buoy surmounted by two upturned brooms is moored in a depth of 3¼ fathoms eastward of the 1¾-fathom patch of Argus Ground.

Havrehesten, a rocky reef extending ⅓ mile northward of the point northward of Guldborg, has ½ fathom water over it. The north and west sides of Havrehesten and each marked by a red spar buoy surmounted by an upturned broom.

East side—Ko Ground.—An extensive irregular-shaped flat extends for a distance of nearly 4 miles from the northwest side of Falster, to the 3-fathom contour line and at its western end, and forming the east side of the approach to Guldborg Sound is Ko Ground, about 1 mile in extent, composed of stones, with a least depth of 5 feet and connected to the shore bank by a neck of shoal water with a depth of 2 fathoms.

Vesterskov Flat extends northward and westward of the point, on which is Vaalse Vester skov; at 1,600 yards from the shore are a number of rocks, and at 1¼ miles the depths are under 1½ fathoms.

Buoys.—A white spar buoy, surmounted by a straw wisp, is moored in a depth of 2¼ fathoms on the northwest side of Ko Ground.

The southwest side of Ko Ground is marked by a red spar buoy, surmounted by an upturned broom; it is moored in 1½ fathoms.

A white spar buoy, surmounted by a straw wisp, is moored in a depth of 2 fathoms northwest of Vesterskov Flat.

Suderö, a small flat island, lies about ⅔ mile northwest of the point on which is Resle Wood.

Suderö Flat, which surrounds Suderö, is broad, and consists of rocky, foul ground; at 1,600 yards westward of the island the depths on it are less than 2 fathoms. The northwest side of Suderö Flat is marked by a white spar buoy, surmounted by a straw wisp; it lies in 2 fathoms water.

Ledas Ground, a small detached shoal, lies close westward of Suderö Flat, and is separated from it by a narrow channel, with a depth of 5 fathoms; a rock on Ledas Ground has a depth of 1¼ fathoms over it. A white spar buoy, surmounted by two straw wisps, is moored in a depth of 2 fathoms westward of Ledas Ground.

Meyers Ground, lying on the shore bank southwest of Resle Wood, is 800 yards in extent, and has a least depth of 1¼ fathoms.

In the bight southeast of Meyers Ground, the shore bank extends nearly 1½ miles offshore, and from Alstrup Cliff, on the south side of the bight, a shoal, with a depth of 2½ fathoms, lies surrounded by 3½ fathoms water. The east side of the 2½-fathom shoal is marked by a red spar buoy, surmounted by an upturned broom.

Alstrup Reef, consisting of sand and stones, lies 300 yards southwest of Alstrup Cliff.

Buoys.—The east side of the channel, along the edge of Alstrup Reef, is marked by three white spar buoys, each surmounted by a straw wisp.

The west side of the dredged channel, at Alstrup Reef, is marked by two buoys with short poles.

Fairway Buoy.—A fairway buoy, conical, painted red and white in bands, and surmounted by a staff and ball, is moored in a depth of 6 fathoms, about 1½ miles northward of the entrance, between Skjelle Reef and Ko Ground, and on the leading mark, which is Taars Church in line with Vigsö Beacon, bearing 178°.

Pilots live at Guldborg and Nykjöbing, and pilot vessels south to the latter place, and north to Fejö, Fæmö, and Masnedö.

Depths.—Between Argus Ground and Meyers Ground the depths are 4 fathoms, shoaling to 3 fathoms toward Alstrup Reef, where there is 20 feet in a dredged channel; at Guldborg, where the sound is only 200 yards in width, the depth is 9 fathoms.

Vessels drawing 20 feet water can reach Nykjöbing from the northward, and those of 8 feet draft from the southward.

Directions.—Coming from the eastward, the southernmost hummock of Kulsbjerg in line with Valdemars Tower bearing 87° and used as a stern mark, leads northward of Vesterskov Flat in a depth of 3 fathoms and to the fairway buoy.

When Taars Church is in line with Vigsö Beacon, bearing 178°, it should be steered for which will lead in a depth of 9 fathoms between the 2¾-fathom extreme of Skjelle Reef and Ko Ground and this course may be continued until Stadager Church is in line with a conspicuous notch in Alstrup Cliff, about 130°, which leads between the 1½-fathom patch and Ledas Ground and farther southeast between Argus Ground and Meyers Ground and after passing the latter edge to the southward to keep the point southward of Alstrup Cliff half a point on the port bow, which should lead in a depth of 3½ fathoms westward of the buoys marking Alstrup Reef.

From Alstrup Reef the course is for Guldborg Ferry pier, on the Falster side, until Majbolle Church opens eastward of the ferryhouse on Laaland, about 189°, which mark leads eastward of Havrehesten, in a depth of 4 fathoms and having passed it, steer in mid-channel.

By night.—Two fixed white lantern lights situated near Guldborg lead between Alstrup Cliff and Havrehesten.

Guldborg Ferry Harbor, on the Laalande side, has a pier extending in a southeast direction for about 450 feet, with a T about 200 feet in length, and northward of this is the ferry harbor; there is a depth of 16 feet alongside the head of the pier, and 9 feet in the ferry harbor, but north and northeast winds raise the water about 4 feet, and those from opposite directions lower it about 3 feet. A warping buoy lies off the pier.

The ferry wharf on Falster is about 130 feet in length, and the ferry harbor is southeast of it; the depths, respectively, are 2 and 1½ fathoms.

Lights.—A fixed white light is exhibited, at an elevation of 12 feet above high water from a white post situated near the village.

Fixed red and green lights are also shown, at elevations of 9 feet above high water, from posts painted in similar colors, the former on the north and latter on the south side of the ferry berth.

Fixed white, red, and green lights, similar to those on Laaland, are exhibited on the Falster Ferry Wharf.

Communication.—The nearest railway station on Laaland is at Saxkjöbing, and on Falster at Northern Alslev; there are telegraph and telephone offices on both sides.

Coal and supplies.—About 500 tons of coal are kept in stock at Guldborg, and fresh provisions and water can also be obtained.

Submarine telegraph cable.—A cable crosses the sound near the ferry.

Guldborg to Nykjöbing.—The channel from Guldborg to Nykjöbing is narrow and winding; Hjelm Channel, eastward of Hjelm nakke, and abreast Majbolle Church, is a small, dredged channel, in which the depth is 20 feet, which depth can be carried from the sea to Nykjöbing, but on account of the sinuosity of the channel, the strong tidal streams, and the liability of mistaking the buoys which mark the channel, it is not prudent to attempt the navigation without employing a pilot.

Buoyage.—The west side of the channel is marked by red spar buoys, surmounted by upturned brooms, and the east side by white spar buoys, surmounted by straw wisps.

Tidal streams.—In settled weather the tidal streams turn regularly, and have a rate of from 1 to 2 knots, but in stormy weather, and especially at the commencement of a southeast gale, they may run to the northward for several days, and attain a velocity of 4 knots in the narrower parts of the channel. The usual rise and fall is about 2 feet.

Nykjöbing Harbor.—The harbor, which fronts the town, consists of two basins, with a total length of about 400 yards, and an average width of about 160 feet; the southern basin is the larger and deeper of the two; the entrance to the northern basin is about 50 feet, and to the southern about 80 feet in width.

The depths in the northern basin are about 7 feet, and in the southern 14 feet, while alongside the outer part of the mole, which forms the west side of the latter, southward of the entrance, the depths are 20 feet. The rise and fall is about 1½ feet, but gales from northwest to northeast raise the level about 3 feet and cause a south-going stream, while those from the opposite directions lower the level about 2½ feet, giving a north-going stream.

Leading lights.—Two fixed red leading lights are exhibited, and are in line bearing 145°. The northern, on the north mole of the southern basin, is shown at an elevation of 16 feet above high water, from a gray lamp post 9 feet in height.

The southern light, from a similar lamp post, but 16 feet in height, is on the south mole, and shown at an elevation of 22 feet above high water.

Pilots reside in the town, a tug is available, and there are three warping buoys outside the harbor and one in the channel.

Town.—Nykjöbing, an old town, prettily situated on the east side of the sound, is the capital of Falster, and had a population of 11,013 in 1910; it is connected to Laaland by Christian IX and Groenge Bridges; the latter, situated to the southward of the town, is 690 yards in length, and the railway runs on it.

Both bridges have swing openings, which can be used by vessels free of charge, between April 1 and October 1.

Communication.—Nykjöbing is connected by rail with Nakskov, via Maribo, and with Masnedö by a ferry crossing Stör Ström, and there are post, telegraph, and telephone offices in the town.

Coal and supplies.—From 5,000 to 40,000 tons of coal are kept in stock; fresh provisions may be obtained, and water from the town waterworks is laid on the quays.

Repairs can be executed in two machine shops in the town.

Time signals.—A time signal is given daily at 1h. 0m. 0s. p. m., mid-European time, from the telegraph office. See Chapter I.

Bridge signals.—One ball, no passage for vessels; two balls, passage for vessels from the north; three balls, passage for vessels from the south.

Trade.—The exports are agricultural produce, and imports feeding stuffs and coal; there are manufactures of chemicals, margarine, sails and flags, tiles, cement, sugar, and tallow.

Ore Head, 2¾ miles eastward of Vesterskov Point, and separated by Vaalse Bay, is wooded, and has off its north end Dyrefod, a small wooded island, and close on its east side Skane Holm, an islet. Orenæs House, a large red building situated on the point southward of Ore Head, is very conspicuous from seaward.

Dryefod Flat, extending 1¼ miles northwest of Ore Head, with depths under 1 fathom, has a vein of deep water on its north side, from which the flat continues to the northwest, with depths of from 7 to 12 feet, for a further distance of nearly 1 mile, the breadth of this outer part in an east and west direction being 2½ miles. The bottom is sand and stones, and the extreme of the flat, with 14 feet water, is 3 miles northwest of Ore Head.

A detached shoal, with a least depth of 13 feet, lies off its northeast side, and northwest of it are two patches of 15 and 16 feet.

Buoys.—The north side of the northeast patch is marked by a conical red buoy surmounted by two upturned brooms.

Southwest of Dyrefod Flat the channel for small vessels into Vaalse Bay is marked by a perch, with an upturned broom, and three other perches.

Clearing mark.—The southernmost hummock of Kulsbjerg, in line with Valdemars Tower, bearing 87°, leads northward of Dyrefod Flat in a depth of 2½ fathoms.

Ore Head Harbor, about 1 mile southeast of Ore Head, is formed in a V shape by two piers, the western extending about 650 feet in a northerly direction and then turning southeast for about 230 feet. The eastern pier extends about 430 feet in a northeast direction, and the entrance between the heads facing east is 250 feet in width; the railway runs onto both of the piers. The area inclosed is about 3½ acres.

The depths in the steam ferry harbor are 12 feet, but north and northwest winds raise the level about 3 feet, while those between southeast and southwest lower it 2½ feet.

Light.—On the west pierhead a white tower, 20 feet in height, exhibits, at an elevation of 20 feet above high water, an occulting light with white, red, and green sectors, the white and red lights being visible 11 miles and the green light 9 miles. For bearings of sectors, see Light List.

White, red, and green fixed lantern lights are shown at the ferry harbor on the arrival and departure of the ferry. (See Light List.)

If the occulting apparatus is out of order a fixed light of less power will be shown.

Communication.—Trains from Nykjöbing arrive seven times daily, and the same from Copenhagen, when the ferry crosses; the station, post, and telegraph offices are near the harbor. Fresh provisions and water can be obtained.

Submarine telegraph cable.—A cable crosses from about ½ mile southeast of Ore Head and another from close eastward of the ferry harbor to the southwest point of Masnedö.

Two white telegraph beacons on Masnedö indicate the direction.

Vedbe Hook, lying off Ore Head Harbor, is a shoal about 1,200 yards in length, in a northwest and opposite direction, with a least depth of 5 feet near its center; it is separated from the shore bank by a small channel, with from 3 to 4 fathoms water.

Buoys.—The edge of the shore bank in the channel southward of Vedby Hook is marked by three white spar buoys, surmounted by straw wisps.

Zealand shore—Knudskov Reef.—From the extreme of Knudshoved, for about 3 miles eastward on the south side, the shore bank to the 3-fathom contour line extends about ½ mile, but about 2½ miles east-southeast of Draget is Knudskov Reef which, with depths under 9 feet, extends 1,400 yards from the coast, and continues for 1 mile farther in a westerly direction to a depth of 4 fathoms; the bottom is rocky.

Patches of 2 and 3 fathoms lie 1¼ and 1½ miles, respectively, southwest and south-southwest of Draget.

Southeast of Knudskov Reef as far as the east end of Oreby Wood the shore bank from 600 to 1,200 yards off under a depth of 3 fathoms slopes gradually to deeper water, but southwest of that it breaks down abruptly from 13 to over 50 feet; the bottom is composed of sand and stones.

Brede Ground, lying nearly midway between the coast of Zealand and Dyrefod, is about 1½ miles in length in an east and west direc-

tion, and about ½ mile in width; the least depth of 12 feet is 1 mile northwest of the buoy marking Dyrefod.

The channel between Brede Ground and the Zealand coast has depths of from 24 to 55 feet.

Directions.—The southern hummock of Kulsbjerg, in line with Valdemars Tower, bearing 87°, leads southward of Brede Ground and 400 yards northward of the buoy marking Dyrefod Flat, in a depth of 15 feet, and, having passed the latter, a southeasterly course may be shaped for Stör Ström.

Stammenakke, the south point of Zealand, in line with the houses on Masnedö, bearing about 108°, also leads southward of Brede Ground in from 15 to 31 feet water, and a small vessel may cross the north end of Dyrefod in a depth of 10 feet, with Stammenakke in line with the pilot house on Masnedö 102°.

To pass northward of Brede Ground in a depth of over 24 feet, Stammenakke should be kept in line with the north end of the railway bridge crossing Masnedsund, bearing 114°, and the mark to steer southeastward to Stör Ström is Gundslev Church, in line with the end of Gaabense Ferry Pier 151°. This leads eastward of Brede Ground in a little over 18 feet water, and eastward of Dyrefod Flat.

By night.—The sector of fixed white light from Ore Lighthouse, bearing between 91° and 96°, leads between Brede Ground and Dyrefod Flat, and the fixed white sector from Ore Head Harbor Lighthouse, between 158° and 171°, leads southeastward to Stör Ström, eastward from Dyrefod Flat, in not less than 18 feet water.

Eastern part.—The preceding descriptions refer to the western portion of Smaalands Farvandet. The eastern portion, from Brede Ground and Dyrefod Flat, is divided into two routes, the northern passing northwestward of Möen and the islands off that side of it and the southern to the southward of the same group.

The northern route, passing close southeast of Zealand, consists of the following channels:

Masned Sound, between Zealand and Masnedö.

Færge Ström, between Zealand and the flat connecting Masnedö and Farö.

Ulvsund, with Zealand and Langö, on the northwest, and Lilleö, Tærö, and Möen, on the southeast side.

Böge Ström, between Zealand and Nyord.

Zealand Coast.—The south coast of Zealand is moderately high and much wooded; Blaabjerg and Kulsbjerg, both conspicuous hills, have been already mentioned. The latter, consisting of several hummocks, one of which, 348 feet high, with a trigonometrical station on it, is the highest point of Zealand.

Færge Ström.—Ore is situated on the coast 2½ miles southeast of Oreby Wood, and about 1 mile from Masnedö, and southward of the former is the entrance to Færge Ström.

Light.—The lighthouse on Ore is a rectangular white tower, 43 feet in height; it exhibits, at an elevation of 43 feet above high water, an occulting light, having white, red, and green sectors, the white and red lights being visible 11 and the green light 9 miles. (For sectors, see Light List.)

Gun practice is occasionally carried out off the coast northwestward of Ore Lighthouse, when the area is marked by red flags.

Masnedö is a low island about 1¼ miles in length in a northwest and opposite direction, lying on the extensive flat, southward of Masned Sound; on the middle of the island are two houses, and at the south point is the ferry harbor and railway station.

A bridge, over which the railway passes from Masnedö town, on the north side of Masned Sound, has a swinging portion in its center, to allow the passage of vessels, the channels on each side of it being 62 feet in width; from the bridge the railway runs to the harbor and ferry pier at the south end of the island.

Leading lights.—Two fixed white leading lights in line, bearing 294°, and 65 yards apart, are exhibited at elevations of 26 and 8 feet, from posts 22 and 5 feet in height, situated close eastward of the bridge, between August 1 and May 1, when the channel is open, also from May to July, inclusive, when required for the mail steamers.

The rear light is shown, at an elevation of 26 feet above high water, from a post 22 feet in height, and the front light from a post 5 feet in height, at an elevation of 8 feet, they are 65 yards apart, in line bearing 114°, and the higher light is visible 6 miles.

Lights.—Two fixed white lights are exhibited from iron standards at an elevation of 14 feet above high water, northwest and southeast of the railway bridge, but are not shown when the channel is blocked by ice.

Ferry Harbor.—Masnedö Ferry Harbor, on the south side of the island, is formed by two piers, each about 880 feet in length, in a southwest direction, and inclining toward each other at their outer ends, the entrance between their heads being about 180 feet in width.

The depth in the harbor is 2 fathoms, but north and northeast winds raise the level 5 feet, while those from the opposite directions lower it about 2½ feet.

Lights.—Fixed white, red, and green lights are shown on the ferry moles at the arrival and departure of the steamers. (See Light List.)

Tidal streams.—The tidal streams set across the entrance, and sometimes attain great velocity.

Masned Sound—Wharves.—There are wharves along the north side of Masned Sound, which have depths of from 16 to 20 feet alongside, and also a small basin, with a depth of 12 feet. Northerly winds raise, and southerly winds lower, the level of the water, the ordinary rise and fall being 1 foot.

Coal and supplies.—Some coal, fresh provisions, and water may be obtained.

Oringe Peninsula, about ½ mile in breadth, extends in a southeast direction from the north side of Masned Sound, and is the west side of a considerable bight, in the northwest corner of which is the town of Vordingborg; Oringe Hospital, on the peninsula, is a conspicuous building.

Dangers—Flynder Ground.—The shore bank westward of Masnedö extends about 400 yards, but gradually closes the shore, and near the town is close-to. Flynder Ground, with 1 fathom water over it, extends 300 yards from the coast, eastward of the town.

Buoy.—The south side of Flynder Ground is marked by a red spar buoy, surmounted by an upturned broom; it is in 12 feet water.

Trelle Ground, extending 1 mile in a southeast direction from the east end of Oringe Peninsula, with depths under 6 feet, breaks down steeply on its south side to Masned Sound.

Buoy.—A white spar buoy, surmounted by a straw wisp, is moored in 8 feet water, eastward of Trelle Ground.

Masnedö Northwest Flat extends northwest from the island for 1¼ miles, within the depth of 4 fathoms, and for 600 yards from the island the depths are less than 6 feet; it connects with Zealand by a bar, through which is a dredged channel. Nearly midway between the extreme of Northwest Flat and the east shoal of Dyrefod are patches of 17 and 18 feet.

Masnedö East Flat is a broad flat extending from the east side of Masnedö to Farö; for 1,600 yards from the island it has depths of from 2 to 6 feet, over a bottom of stones and weeds.

Steenör is a rocky shoal, with a depth of 4 feet, lying on the edge of the 1-fathom contour line, 1 mile east-northwest of the south point of Masnedö.

Dredged channel—Depth.—About 1,400 yards westward of the railway bridge a channel is dredged through the bar, which connects Masnedö Northwest Flat with the Zealand shore bank; the channel is 190 feet in width and has a depth of 18 feet.

The depths in Masnedö Sound are from 30 to 60 feet in several spots, and near Flynder Ground they are from 11 to 12 feet; in Masned Sound Harbor, on the north side of the sound, they are 13 feet.

Beacon.—A pole beacon, surmounted by a disk, marks the end of the ferry pier eastward of the wharves.

Buoyage.—On the north side of the channel a white can buoy, surmounted by a pole and a down-turned broom, is moored in a depth of 20 feet, off Ore.

The north side of Masnedö Northwest Flat is marked by a red spar buoy, surmounted by an upturned broom, moored in 15 feet water.

The dredged channel is marked on the south side of its western entrance by a conical red buoy, surmounted by three upturned brooms; midway by a red spar buoy, surmounted by a broom, and at its eastern end by a spar buoy, with two brooms.

The north side has a white spar buoy, with a straw wisp, midway through the channel.

The buoys on Flynder Ground and Trelle Ground have been mentioned, and Steenör is marked by three white spar buoys, two being on its northeast side, with single straw wisps, and one on the east end, surmounted by two wisps.

Pilots reside at the south end of Masnedö, the pilot house being the first dwelling northward of the railway buildings. Vessels from the westward may obtain pilots from Nyborg, Albuen, Fejö, Fæmö, and Guldborg, while those from the eastward will find them at Tærö or Grön Sound.

Directions.—From the westward, Stammenakke, in line with the north end of the railway bridge, bearing 97°, leads to the western entrance of Færge Ström, and when approaching Ore Lighthouse the beacon on the ferry wharf should be brought in line with the middle of the railway bridge, 113°, which will lead through the dredged channel.

When nearing the bridge edge to the northward to pass through it in mid-channel, keeping a little to the southward after passing through, to pass southward of the buoy marking Flynder Ground, the mark for leading southward of it and between Trelle Ground and Steenör, being the south side of a thicket on the north end of Masnedö, in line with the northernmost cottage near the beach, about 292°.

By night the leading lights, bearing 114°, lead through the dredged channel.

Signals.—The following signals are made from the railway bridge:

A black ball—no passage; vessels should anchor.

Three black balls—passage for vessels from the eastward.

Two black balls—passage for vessels from the westward.

If a blue flag is hoisted, it denotes that vessels should warp through the bridge.

Tidal streams.—The tidal streams change regularly during settled weather, but with stormy conditions they become irregular and may run in one direction for several days; they sometimes attain a rate of from 3 to 4 knots.

Telegraph cable.—A cable between Zealand and Masnedö crosses Masned Sound on each side of the railway bridge.

Vordingborg Harbor, a small harbor northward of Oringe Peninsula, has a wharf 280 feet in length, with a depth of 7 feet alongside, there being about a similar depth in the harbor, but gales between northwest and northeast raise the level 4 feet, and those from the opposite directions lower it about 2½ feet.

The harbor is approached by a very narrow channel between the northeast side of Trelle Ground and the shore bank, in which there is a depth of 8 feet.

The channel is buoyed in accordance with the Danish system. (See Chapter I.)

Directions.—Valdemars Tower, in line with the easternmost house in the town of Vordingborg, lead between Trelle Ground and a 1-fathom patch on the east side, after which the buoyage is a guide.

Town.—Vordingborg, an old town, having a population of about 3,600, is prettily situated; Valdemars Castle, with the Gaasetaarn (Goose tower) dates back to between 1340–1375.

Communication.—There is a regular steamer to Möen, and railway communication with Copenhagen and Gjedser; the station is in the northwest part of the town, and there is another at the harbor; the post and telegraph offices are in the town, where there is a telephone to the harbor.

Water, from a well, is good and plentiful.

Coast.—From Vordingborg the coast trends in a southeast direction for about 5 miles to Stammenakke, the rounded south point of Zealand, and along it are some large woods.

Beacon.—Close to the beach on the southwest side of Stammenakke, is a beacon, 23 feet high, consisting of a red pole, surmounted by a white ball.

Farö, 3⅓ miles southeast of Masnedö, is 30 feet high and without wood; two farms are situated on the island, and near its center is a small, low mill.

Færge Ström, eastward of Masned Sound, has on its north side the shore bank extending from Zealand, and on the south Masnedö Öster Flat, which has depths over it of from 7 to 11 feet.

Depths.—Færge Ström is fairly steep-to throughout its entire length, especially on the north side, and the depths in mid-channel are from 18 to 30 feet; it is not under 200 yards in breadth.

Buoy.—A red spar buoy, surmounted by an upturned broom, is moored in a depth of 11 feet, on the southwest side of Kirke Ground on the north side of the channel.

Directions.—There are no leading marks for Færge Ström, but steering eastward through it the southern part of the village on the north shore of Masned Sound will be astern. A small vessel can cross the flat between Masnedö and Farö, after passing Stennör, by keeping Valdemars Tower in line with the east side of Oringe Wood; or deeper water may be obtained over the flat by keeping half of Borren open southward of Stammenakke, 86°.

Ulvsund.—Ny Farvand, a narrow channel north-northwest of Farö, and leading eastward of Færge Ström, is the commencement of Ulvsund, which continues close along the south side of Stammenakke, already described.

About 2½ miles northeastward of Stammenakke is Langö, an island about 1½ miles in length in a northeast and opposite direction, connected to Zealand by a flat, with less than 3 feet water, and northeast of Langö is Kallehave, from which is a ferry to Koster Island. Kallehave Church, about 1 mile westward of the point, is white and has a tower, and northward of the church is Viemose Mill.

Bogö, about 3 miles in length in an east and west direction, and 1½ miles in greatest width, lies southeast of Farö, connected to it by a shallow flat; the eastern part of the island is wooded and there are a number of houses on the hills. Bogö church and mill, situated eastward of the middle of the island, are both conspicuous. The island and its light are again mentioned below.

Tærö, situated northeastward of Bogö, is 1½ miles in length, in an east and west direction, and about ½ mile in width; on the island are Tærö Farm and three small mills.

Beacons.—On the east end of the island is a beacon, surmounted by a square tablet.

On the south side are two pole beacons, each surmounted by a ball.

On the north end of the island two pole beacons are each surmounted by a cross.

Pilots live on Tærö.

Lilleö, a small and very flat island, lies on the flat ½ mile westward of Tærö.

Möen, northwest coast.—From Dame Point, 1 mile eastward of Bogö, the northwest coast of Möen, stretches for 4½ miles in a northeast direction, to where it connects with Koster Island, and between is a peninsula extending 1½ miles westward from Möen. Eastward of Koster is a large bay, in the southeast corner of which is the town of Stege.

Borren, an island 1 mile southwest of Koster, with a conspicuous hill 104 feet high and eastward of Koster, off the northwest coast of Möen, Stege Church, with a slender spire, the high chimney of Stege Sugar Factory, with Stege Mill, northeast of the church, are all conspicuous; about 2½ miles northward of Stege is Hegnede Brickworks, which has also a high and conspicuous chimney.

Shore bank.—From Ny Farvand the shore bank extending from Zealand coast is from 100 to 300 yards in width and steep to Ulvsund, but northeast to Petersværft Pier it increases its width and surrounds Langö, being about 600 yards off the southeast side of that island; between the northeast end of Langö and Kallehave Point it is about ¾ mile offshore, with a small channel running through it.

At the entrance to Ny Farvand the channel bifurcates, the southern branch, named Kalve Ström, being a blind channel about 4 miles in length in an east-southeast direction, with depths of from 24 to 44 feet. It passes close northward of Farö and Bogö.

Buoys.—The north side of Ny Farvand is marked by five red spar buoys, surmounted by upturned brooms.

The south side of the shore bank, near Stammenakke, is marked by a red spar buoy, surmounted by an upturned broom.

Skipper Ground, which forms the south side of Ny Farvand, is the end of a flat, 3½ miles in length, in a west-northwest direction from Lilleö. It has depths of from 7 to 10 feet over it, with one patch of 6 feet.

Letten Spit, on the same flat as Skipper Ground, extends nearly 2 miles west-northwest of the west end of Tærö, with Lilleö on it. It has depths of from 1 foot to 6 feet. Skipper Ground and Letten form the south side of Ulvsund as far as Tærö.

The shore bank extends nearly 800 yards northward of Tærö at its eastern end.

Buoys.—The north side of Skipper Ground, which forms the south side of Ny Farvand, is marked by five white spar buoys, each surmounted by a straw wisp.

The north side of Letten is marked by two white spar buoys, surmounted by straw wisps.

The north side of the shore bank from Tærö is marked by three white spar buoys, surmounted by straw wisps.

South Stenkar, 500 yards in extent, with 3 feet water over large stones, is off the north side of Tærö.

North Stenkar, consisting of large stones, with depths from 3 to 5 feet, breaks down steeply on the channel side, but is joined to South Stenkar by a small tongue of shoal.

There are several shoal patches in the vicinity of North Stenkar.

Buoys.—The north side of South Stenkar is marked by a white spar buoy, surmounted by a straw wisp, and North Stenkar is marked by four buoys.

West.—Red spar, with upturned broom.

Northwest and northeast.—White spar, with straw wisp.

Southeast.—Striped red and white spar, broom over straw wisp.

Shore bank.—Between Tærö and Möen the depths are very irregular, and from the point of the latter island eastward of Tærö, the shore bank extends about 600 yards, maintaining about that distance until off the bight separating Borren and Koster, where it is about 1,200 yards distant, closing again to 600 yards northwest of the latter island.

Buoy.—The northwest side of the shore bank, off Koster, is marked by a spar buoy, with red and white bands, and surmounted by a broom over a straw wisp.

North and South Knigge are broad flats, lying about 1 mile northeast of Kallehave, with depths of from 8 to 10 feet over them; there is a least depth of 6 feet on each shoal; North Knigge lies on the west and South Knigge close on the east side of the channel.

A patch of 6 feet lies between South Knigge and Lindholm.

Buoys.—The southeast side of North Knigge is marked by a red spar buoy, surmounted by an upturned broom, and the west side of South Knigge by a white spar buoy, with a straw wisp.

Channel—Depths.—Ny Farvand, at the west end of Ulvsund, has a least depth of 14 feet on a patch, and eastward of this channel the fairway lies close under the Zealand coast, in depths of from 24 to 55 feet.

Eastward of Petersværft Pier the channel between North Stenkar and Langö is named Langö Vrid, its narrowest part being rather more than 150 yards; the channel then is northward of a 6-foot patch (white spar buoy with stray wisp on its north side), after which, between Langö Flat and Borren, it is 650 yards in width and continues northeastward between Kallehave and Koster.

The bottom of the channel is mud and ooze, very soft in the northern part.

Buoyage.—The buoys on the principal dangers have been mentioned; otherwise the channel is marked in accordance with the Danish system. (See Chapter I.)

Directions.—The buoys are a guide when passing through Ny Farvand, and eastward of it a vessel should keep from 200 to 400 yards off the Zealand coast and, having passed the buoy, marking the shore bank southward of Stammenakke, Kallehave Church brought in line with the end of Petersværft Pier, bearing 54°, will lead northward of the patch lying off it.

The pier end should have a berth of about 70 yards and the edges of the wood near Stammenakke then be brought astern, steering to pass northward of the northernmost buoy of Langö Vrid.

The chimney of Stege sugar factory, in line with the north end of a cliff near Borren, bearing about 80°, leads between the shore bank southeast of Langö and the 6-foot patch, and Bogö Church, in line with the north end of a conspicuous broad bush on Tærö, bearing 230°, used as a stern mark, leads between Kallehave and Koster, in more than 18 feet water.

When nearing a 7-foot patch, westward of Koster, which will be, as Kallehave Church comes in line with Viemose mill, 347°, Bogö Church may be kept midway between the bush and the pilot mark, until abreast Koster, when the church and bush may again be brought in line, until the trees on the eastern slope of Borren are in line with the end of Koster Ferry Pier, which leads between North and South Knigge, from which the pilot's lookout on Nyord, in line with the eastern part of a cliff west of Nyord Town, leads, in depths of from 8 to 9 feet, to the Bogö Ström.

Petersværft Pier, about 1 mile northeast of Stammenakke, is 213 feet in length, and has depths of from 3 to 4 feet at its end, but 40 yards off it there is 36 feet; north and northeast winds cause such a high water that the pier is covered, and those from the southward lower the level so much that a boat can not approach it.

Communication.—There is a railway station at Langebæk, distant 2½ miles, and a telephone at Petersværft.

Kallehave Ferry Harbor consists of a pier extending about 700 feet in a southerly direction, westward of which is a small basin.

There is a depth of 12 feet at the pier end, and 9 feet in the basin, but northeast gales raise, and those from southwest lower the level 4 feet.

Light.—Fixed white lights are shown from the ferry pier for the use of the ferry.

Communication.—The railway runs on to the pier, and there is a post, a telegraph, and a telephone office. Fresh provisions and good water may be obtained from the ferry house.

Submarine telegraph cable.—A cable crossing Ulvsund from Kallehave to Koster Ferry Pier is marked on Kallehave by two telegraph beacons. (See Chapter I.)

Koster Ferry Pier, extending about 900 feet in a northerly direction from Koster, has a depth of 9 feet at its outer end, and 7 feet farther in, the alteration in level is as at Kallehave.

Light.—A fixed red light is exhibited from the pier end from September 1 to May 1.

Telegraph cable.—See above.

Stege Bay, between Koster and Ulvshale Peninsula, is about 3 miles in width; Stege is in the southeast corner, and in the center of the bay is Lindholm.

Cralen, extending 1 mile in a northerly direction from the north coast of Möen, westward of Stege, has depths of from 2 to 4 feet over it, the bottom being sand and stones.

Two red spar buoys, surmounted by upturned brooms, are moored in 8 feet water northward of Cralen.

Rödstensnakke, extending about 600 yards from the point, 1 mile northward of Stege, is composed of sand and stones, with depths of from 3 to 8 feet.

The west side of Rödstensnakke is marked by a white spar buoy, with a straw wisp.

Lindholm Flat, surrounding Lindholm, is closely strewn with rocks; that part on the northwest side is named Lindholm Bredö, and on it is a small patch with a depth of 4 feet 600 yards from the island; the flat extends 1,000 yards southward of the island, with depths under 8 feet.

Northern shore bank.—From the south side of Ulvshale and of Nyord, a flat stretches fully 1 mile southward, with depths of from 1 foot to 5 feet; Tyrholm Island lies on the flat, and there are several blind channels through it with deeper water.

Koster Knigge is a small patch of 8 feet lying south-southwest of Lindholm, and there are other detached shoals.

Buoyage.—The shore bank from the north side, and Lindholm Flat, are buoyed in accordance with the Danish system; Chapter I.

Koster Channel is a dredged channel which, from 600 yards northward of Koster, has an easterly direction, passing northward of Koster Knigge and southward of Lindholm Flat, then northward of Cralen, to the channel to Stege, the depth throughout being 12 feet.

Buoys.—A white can buoy is moored close to the west end, and a red conical buoy close southward of the western angle of the channel; white and red spar buoys, with straw wisps or upturned brooms, respectively, mark the remainder of it.

Stege Harbor consists of two small basins, one on each side of the outlet of Stege Nor, a shallow lake about 3 miles in length in an east-northeast and opposite direction, and nearly 1 mile in greatest width.

The northeast basin is triangular shaped, each side being about 250 feet in length; the southwest, protected by a breakwater about 600 feet in length in a northeast direction, is about 150 feet in width. The entrances facing southwest and northeast are about 60 and 160 feet in width, respectively.

The depths in Koster Channel, in the channel of approach, and in the harbor are 12 feet, but easterly winds raise, and those from the westward lower the level about 3 feet.

Lights.—A fixed red light is exhibited from the northeast basin breakwater and a fixed green light, at an elevation of 8 feet, from a post 3 feet high, on the southwest breakwater.

A fixed light with white, red, and green sectors is shown from a square, green lighthouse on warehouse at elevation of 20 feet above high water. This lighthouse is on the west side of the harbor.

Beacons.—On the southwest breakwater, and on the south side of the southwest basin are two leading beacons for the channel between Stege and Cralen; they are painted white and are surmounted by hourglass top marks.

Pilots may be obtained at Stege, from Langö, and from Nyord, and the services of a tug are available.

Directions.—Steer by the buoys from the west end of the channel until a tiled house on Langö is in line with the middle of Koster Pier, bearing about 258°, which should be used as a stern mark, and when Kallehave Church is in line with Kallehave Ferryhouse, about 277°, it will lead, as a stern mark, between the outermost buoys between Lindholm and Cralen.

When Ravne Mill is in line with the west side of Nyord 313° it will lead, as a stern mark, to the entrance to the dredged channel, and the beacons in line about 149° will lead through it until the last buoy is passed, when steer for the harbor.

Town.—Stege is situated on the east side of the outlet of Stege Nor.

Communication.—The nearest railway station is at Kallehave, and telegraph at Storegade; there is a post office near the harbor.

Coal and supplies.—Some coal is stocked, fresh provisions are plentiful, and water can be obtained from a pipe from the waterworks, which is near the harbor.

Repairs.—Small repairs might be executed, and there is a crane lifting 5 tons.

Möen Tileworks are situated in the northeast corner of Stege Bay, where there is a pier, 1,300 yards in length in a southwest direction, with a depth of about 6 feet on the southeast side of the outer end. An old pier about 1 foot under water is situated 700 yards southwest of the outer end and is marked by a buoy with a green staff and flag.

Böge Ström.—The northern entrance to Böge Ström has been described (Chapter VI). The south entrance is southward of the west end of Nyord, and between Sten Ground and Bredö, the former with a depth of 6 feet and the latter with 2 feet.

Buoys.—Close eastward of Sten Ground are two red spar buoys, surmounted by upturned brooms, and westward on Bredö is a white spar buoy, with a straw wisp.

Directions.—The pilot's lookout on Nyord in line with the eastern part of a cliff westward of Nyord town leads between Sten Ground and Bredö, and after passing these a pilot may be obtained from Nyord.

Southern Channels.—The channel which passes southward of Bogö and Möen and northward of Falster is divided into Stör Ström, extending from Dyrefod Flat to Farö; Sodse Gab, which is west and southwest of Bogö, and from Farö to the west end of Stubbekjöbing, and Brön Sound from Stubbekjöbing to Hjelm Bay. Bogö Island has been mentioned.

Stör Ström, the first division of the southern channel, is formed on its north side by Kalve Reef, Masnedö East Flat, Middle Ground, and Farö Jord, and on the south side of the northeast coast of Falster.

Falster—Northeast coast.—From Ore Head Ferry Harbor the coast forms a bay, which stretches southeast for about 3 miles, terminating in Skovby nor; the land is moderately high, and wooded in some parts; about 1 mile southeast of Ore Head Ferry Harbor is Gaabense Ferry Pier.

On the east side of the bay is a peninsula, about 2 miles in width, and somewhat low: Havnsö Næb is its northwest, and Farnæs its northeast point. Eastward of the peninsula the coast trends about east-southeast for 4½ miles to Skanse Point, the northeast extreme of Falster; it then turns south-southeast for 3½ miles to Hestehoved.

Ore Church, with a high, black spire, North Vedby, North Alslev, and Gunslev churches, Blæsebjerg Mill, Stubbekjöbing Church, and Ore Mill are all conspicuous objects. Stubbekjöbing Church has a broad, red tower, and Ore Mill is ½ mile southeast of the town; Ore Tile Works, with a high, slender chimney, is near the beach, northeast of the town.

Grön Sound pilot house, a white building with a tower 26 feet in height, is southward of Skanse Point, and 1 mile south of the point is Næsgaard, a high, white building, lying near a small wood; Heste Head pilot house is on a high cliff 2¾ miles southward of Skanse Point and 1 mile farther south is Heste Head Lighthouse.

Light.—On the northwest point of Bogö, from the gable of a gray wooden building 12 feet in height, an occulting light, with white, red, and green sectors, is exhibited at an elevation of 20 feet above high water, and is visible 9 miles. (For bearings of sectors, see Light List.)

Dangers—North side.—Kalve Reef is a flat extending about 1 mile northwest of Masnedö Kalv, a small island southwest of Mas-

nedö, and near its west side is a patch with a depth of 5 feet, which is about ¾ mile from Masnedö; on its southwest side Kalve Reef breaks down steeply to a depth of about 30 feet, and there is a blind channel between Masnedö and Masnedö Kalv.

Eastward of Masnedö Kalv a bank with depths under 12 feet connects with the shore bank on the southwest side of Masnedö, and farther eastward is Masnedö East Flat, Middle Ground, and Farö Jord, which, together, connect Masnedö with Farö.

Buoy.—On the southwest side of Kalve Reef a red spar buoy, surmounted by an upturned broom, is moored in a depth of 26 feet.

South side.—Vedby Hook, the westernmost shoal on the south side, has been already mentioned.

Havnsö Nakke, a flat about ½ mile in breadth, extends for fully 1 mile in a west-northwest direction from Havnsö Næb, and has depths of from 3 to 5 feet. There is a vein of somewhat deeper water between it and Gaabense Pier, and on its north side it breaks down steeply to a depth of over 40 feet.

Northward of the peninsula and eastward of Havnsö Næb the shore bank is about ⅜ mile in width, gradually closing on the coast.

Shoals.—Northward of Havnsö Nakke are some patches, with depths of 15 and 16 feet, and westward and northwestward of Bogö Lighthouse are others of from 7 to 12 feet.

Buoys.—On the north side of Havnso Nakke, and just outside the 2-fathoms contour line, is a white can buoy, surmounted by three down-turned brooms, and 200 yards southward of a 7-foot patch on Middle Ground, is a red conical buoy, surmounted by three upturned brooms; both are moored in 30 feet water.

Directions.—A vessel from the northwestward, with Gunslev Church in line with the end of Gaabense ferry pier, bearing 150° (view, p. 482), will pass just northeastward of Vedby Hage, in a depth of 18 feet, but if Kalve Reef buoy is seen, the course may be shaped for Farnæs Point when it is passed, and when abreast Havnsö Nakke buoy, Bogö Church should be steered for.

Bogö Church open southward of the low south point of Farö, bearing 110°, leads southward of Farö Jord, and when Stubbekjöbing Church is in line with the southwest point of Bogö it will lead to the entrance to Sodse Gab.

By night.—Coming from the northwest, steer in the fixed white sector of Ore Head Light, between the bearings of 158° and 171° until in the fixed white sector of Bogö Light, between 115° and 118°.

Anchorages.—Large vessels can anchor all over the channel eastward of Masnedö, but small vessels will find the best anchorage on Mesnedö East Flat, where the holding ground is good.

Gaabense Pier extends in an easterly direction, has a depth of 8 feet at its end, and is approached by a dredged channel, 200 yards in length, in a south-southeast direction, with a similar depth, which is marked in accordance with the Danish system of buoyage. (See Chap. I.)

Gales from northwest to northeast raise the level of the water 3 feet, and those from the opposite directions lower it about 4 feet. A small quantity of coal, fresh provisions, and water can be obtained, and there is a telephone at the pier.

Sodse Gab—North side.—The southwest and south sides of Bogö, which form the north side of Sodse Gab, trend south for about 1 mile, and then east-southeast for 2½ miles to the southeast point of the island, and about ¾ mile westward of that point is Lindebro, or Bogö Bro.

The southwest coast of Möen, separated from Bogö by a shoal flat named Bogö Letten, extends in Borgsted Peninsula about ¾ mile in a westerly direction, and on the south side of the peninsula is Grön Sound ferry.

Fane Fiord, southward of Borgsted Peninsula, extends more than 1 mile eastward into Möen, with a breadth of about 400 yards, and 1½ miles southeast of its southern entrance point is Harbölle, the southwest point of Möen, on which there is a battery; from Harbölle the south coast trends eastward for 2 miles to Madses Cliff.

Lights.—North Harbölle leading lights, used for the navigation of the eastern part of Sodse Gab, are situated about ⅔ mile northwest of Harbölle and consist of a rear light, fixed white, which is exhibited, at an elevation of 48 feet above high water, from an iron standard, 25 feet in height; it is visible 12 miles.

The north front light is fixed red and exhibited at an elevation of 16 feet above high water from a shed 14 feet in height; it bears 286° distant 592 yards from the rear light and is visible 9 miles.

The south front light, fixed green, is similarly exhibited to the north light and visible from the same distance; it bears distant 536 yards from the rear light.

Leading lights, rear light seen midway between front lights 104°. The rear light, in line with north front light, indicates the north side of the channel; in line with south front light indicates the sout side of the channel. Shows with full power from 95° to 113°.

Bredemands Hook, on the south coast of Bogö, has depths of 6 feet at 800 yards from the coast, and southward of its outer edge is a shoal with from 18 to 24 feet over it.

South side.—The shore bank eastward of Farnæs Point is very narrow, but becomes wider farther south, and in the bight westward

of Stubbekjöbing it is ½ mile off and steep-to, breaking down suddenly from 9 to 36 feet.

Depths.—In the western part of the channel, between Farnæs Point and Bogö, there are depths of over 100 feet, and in mid-channel southward of Bogö there is from 28 to 62 feet.

Buoy.—A conical red buoy, surmounted by an upturned broom, is moored in a depth of 15 feet southwest of Bredamands Hook.

Directions.—Having approached Sodse Gab with Stubbekjöbing Church in line with the southwest point of Bogö, bearing 143°, the west side of Bogö can be passed at about 100 yards distant, and Ore mill, in line with a shed on the northwest end of Stubbekjöbing Harbor, bearing 136°, leads southwest of Bredemands Hook.

A vessel can approach the west side of the channel till Valdemars Tower is in line with the east side of Farnæs Point, 331°, and will pass southward of Bredemands Hook, with Fanefiord Church in line with the south side of the ferry houses at Borgsted, 97°; the church open southward of the southernmost house at the ferry, about 92°, leading southward of the 16-foot patch. The houses on Masnedö open eastward of Farnæs Point, bearing 315°, leads northeast of the 11-foot patch off Stubbekjöbing.

By night.—Entering Sodse Gab in the fixed white sector of Bogö Light, between the bearings of 115° and 118°, when in the fixed green sector of Stubbekjöbing Light, between 147° and 150°, keep to the southward in the fixed white sector from Stubbekjöbing, between 150° and 152°, and when Harbölle fixed red and fixed white leading lights are in line, bearing 106°, edge to the eastward, keeping the rear fixed white light between the fixed red and green front lights, or rather nearer in line with the latter, about 103°, which will lead between the 11 and 16 foot shoals northward of Stubbekjöbing.

Anchorage.—Owing to the depth of water there is no good anchorage for large vessels, but small craft can anchor in depths of from 8 to 10 feet in the bight westward of Stubbekjöbing.

Grön Sound—North side.—Bogö Letten, a flat with depths under 6 feet, which connects Bogö and Möen, is steep-to on the channel side, and the shore bank between it and Bredemands Hook is about ¼ mile in breadth and also steep.

Southward of Borgsted the shore bank is about ¼ mile in breadth, but gradually narrows eastward, and is close to Harbölle.

South side.—From Stubbekjöbing to Skanse Point the shore bank, with depths of from 3 to 10 feet and uneven bottom, is about 600 yards off at its eastern end, gradually narrowing until off the latter point it is close-to. It is composed of sand and stones and is steep-to.

Stubbekjöbing Harbor, on the south side of the entrance to Grön Sound, is oblong-shaped, about 200 yards in length in a west-

northwest and opposite direction and 100 yards in breadth, the entrance, facing north, being about 80 feet in width.

It is approached by a dredged channel, in which the depths are 19 feet, there being the same depth in the center of the harbor, with from 12 to 14 feet in the western, and 7 feet in the eastern part; winds from north to northeast raise the level about 4 feet, and those from the opposite directions lower it about the same, the ordinary rise and fall being 1 foot.

Buoy.—A green buoy with two green flags is moored about 220 yards northeastward of a wreck with masts showing above water about 900 yards from shore, between Stubbekjöbing and Sodse Gab.

Light.—Near the west end of the town an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 47 feet above high water, from the gable, 12 feet in height, of a brown wooden dwelling; the white light is visible 12 miles, the red light 10, and the green light 8 miles. For bearings of sections, see Light list.

Leading lights.—On the west breakwater head a fixed light, with white and red sectors, is exhibited, at an elevation of 10 feet above high water, from a pole 5 feet in height; it shows red westward over the bridge, and white elsewhere.

A fixed red light is shown from the harbor office, at an elevation of 23 feet above high water, from a pole, 27 feet in height, painted white, with a disk; with the preceding it forms leading lights, in line bearing 172°, for the dredged channel when the harbor is free from ice.

Buoyage.—The dredged channel is marked by buoys in accordance with the Danish system. (See Chapter I.)

Pilots may be obtained for the harbor and for the channels eastward and westward of it. There are warping buoys on each side of the channel, and a warping pole in the harbor.

Town.—Stubbekjöbing has a post and telegraph office, but the nearest railway is at North Alslev, distant 5 miles; the harbor and town are connected by telephone.

Coal and supplies.—From 2,000 to 6,000 tons of coal are kept in stock and fresh provisions and water can be obtained.

Ore Pier, 1 mile eastward of Stubbekjöbing, is 66 feet in length and connected to the land by a wooden pier 64 feet in length; the pier, which belongs to the brick works, is approached by a dredged channel, in which there is a depth of 8 feet, but winds between northwest and northeast raise the level 5 feet and southerly winds lower it 2 feet. The current runs strongly in the dredged channel.

Lindebro.—The south side of Bogö trends southward for about 1 mile and then east-southeast for about 2½ miles, and at 1¾ miles of this latter distance is Lindebro, or Bogö Bro, a pier, which extends

for about 250 feet in a southeast direction, has a depth of 7 feet alongside, and is approached by a dredged channel with a depth of 8 feet; but northeast winds raise the level 5 feet and those from the opposite direction lower it 4 feet; the channel is marked in accordance with the Danish system.

Lights.—Near the pier is a fixed white and a fixed red lantern light, and these in line lead through the dredged channel to the pier; they are shown from October 1 to March 1. There are post, telegraph, and telephone offices on the island.

Borgsted.—Grön Sound Ferry crosses the sound from Borgsted to Falster, and at Borgsted is a pier with depths of from 5 to 6 feet alongside.

Light.—Westward of Borgsted Ferry, from the gable of a brown wooden building 12 feet in height, a fixed light with white, red, and green sectors is exhibited at an elevation of 11 feet above high water; it is visible 8 miles. (For sectors, see Light List.)

Skanse Point is the northeast point of Falster, and near it is the southern ferry pier, which has a depth of 6 feet alongside, but with winds between north and east the level is raised 5 feet, and lowered 3 feet with winds from southwest; with gales between north and northeast it is unsafe to lie at this pier.

Leading lights.—Distant 540 yards, 324°, from the pilot's tower, a white iron framework, 60 feet in height, exhibits, at an elevation of 63 feet above high water, a fixed white light which is visible 13 miles. (See remarks in Light List.)

Close eastward of the pilot's tower, a white building 7 feet in height, exhibits, at an elevation of 16 feet above high water, a fixed white light which is visible 9 miles. The lights are in line bearing 144°.

Directions.—Steer with Fane Fiord Church in line with the south side of the ferryhouses near Borgsted, bearing 93°, until Stubbekjöbing is passed, when alter for Harbölle, touching Skanse Point, 113°, which will lead to the latter point.

By night.—Harbölle fixed white rear light should be kept between the fixed red and green lights, bearing 92°.

Submarine telegraph cables.—A cable crossing Grön Sound from near the southeast point of Bogö to about ¾ mile eastward of Stubbekjöbing, is marked on Bogö by two white telegraph beacons.

A cable also crosses the sound between the ferry piers, and its direction is marked on Falster by two white telegraph beacons.

The eastern part of Grön Sound is described in Chapter XI.

CHAPTER IX.

THE LITTLE BELT, WITH ADJACENT FIORDS, SOUNDS, AND CHANNELS.

The Little Belt, the westernmost passage between the Kattegat and the Baltic Sea, has on the eastern side Fyen and Ærö, and on the western side Jutland, Schleswig and Alsen, its northern boundary being an imaginary line joining Æbelö and Björnsknude; its southern limit is a similar line joining Vejnæs Nakke, the southern point of Ærö, with Pöhls Huk, the southeast extreme of Alsen.

It is about 68 miles in length and about 600 yards in least breadth between the land on either side northeastward of Gals Cliff, but the part presenting the greatest difficulty in navigating it is Baagö Sound, between Fyen and Baagö, where are several outlying shoals; at this part of the Belt there is also a channel named Fyr Channel, westward of Baagö, and Aarö Sound between Aarö and the Schleswig Coast.

The Little Belt is available for vessels for deep draft and of any length, and is frequently preferred to the Great Belt by those having experience in navigating both channels, for in thick weather the navigation of the Little Belt is easier, and the currents usually follow the direction of the channels and run with less strength than, and not obliquely as, in the Great Belt.

Against these advantages may be placed the fact of the greater distance by this route for vessels bound to eastern ports of the Baltic, also that the navigation of Baagö Sound becomes dangerous in thick weather when the leading marks can not be distinguished, and that Aarö Sound can not be used with safety by a vessel exceeding 27 feet draft even in clear weather.

Small vessels have the increased advantages in the Little Belt of smoother water and a larger number of secure anchorages, with easy access, than in the Great Belt.

Many of the shoals being composed of or covered with white sand show well under favorable conditions of light and wind, and may be seen from the bridge of a large vessel from a distance of as much as 1 mile, and night navigation, owing to the number and excellence of the lights, is almost easier than by day.

Depths.—The depths in the northern part are from 8 to 10 fathoms, over a generally even bottom, but farther south, where the channel narrows, they increase, and near Fredericia there are as much as 24 fathoms, while westward of Fænö there is a depth of 43 fathoms.

In Bredningen, southward of Stenderup Hook, the depths are from 6 to 11 fathoms, with a comparatively even bottom, and in Baagö Sound they are from 7 to 9 fathoms, but southward of Baagö they increase to 19 fathoms, and northeast of Alsen they are about the same.

With care it is possible for a vessel to have not less than 7 fathoms throughout the Little Belt, but in Aarö Sound not more than 28 feet can be depended on.

The bottom in the northern part is generally mud, oaze, and sand, but near the coast in Snævringen Channel there is sand, stones, and gravel. In Bredningen the bottom is sand, mud, and oaze, but southward of Baagö and Aarö, and on detached patches, it is sand and stones, and between Alsen and Fyen sand, oaze and clay; the holding ground is good.

Compasses.—As mentioned in connection with the navigation of the Great Belt, the necessity for correcting the compass before entering, and checking it by every opportunity which offers when passing through the Little Belt, can not be too strongly impressed. Great attention is also required to steering, especially in the narrower parts of this channel, where a range finder will be found invaluable if carefully checked on all occasions.

Currents.—Winds from east-northeast, through east and south, to southwest cause a north-going current, and those from other directions a south-going stream, the former being more prevalent in the early part of the year, sometimes continuing for several consecutive days, irrespective of the direction of the wind, which, however, has more influence on the duration and strength of the current as the year advances.

The south-going current is particularly prevalent in autumn, running at that time with greater velocity than the north-going stream.

Southerly current.—The south-going current, entering Snævringen Channel, sets toward the coast on each side, on the east for about a mile southward of Strib Point, and on the west between Fredericia and Lyngs Point, setting strongly in the latter case. Owing probably to being deflected by Skans Point, it does not enter Mölle Bay.

From Lyngs Point the current, setting toward the Fyen Coast near Middelfart, follows that coast and then sets across the channel toward West Börup Lighthouse, its main portion passing westward of Fænö Kalv toward Tönnes Point and afterwards eastward of Baagö.

Weak southerly currents set through Fænö Sound and Fyr Channel, westward of Baagö, and while the south-going current is running in the main channel past Fænö there is a north-going current setting between Fænö and Fænö Kalv as far as Gals Cliff.

Northerly current.—The north-going current, occupying the whole width of the Little Belt, when setting past Fænö Kalv, also sets through Fænö Sound and, striking the coast about Damgaard, follows it to Lyngs Point, from which it sets across to the Fyen Coast and follows the latter to the northward.

A north-going stream is usually found close in off Fredericia Harbor, even when there is a south-going stream in the mid-channel of the Little Belt.

Boundary.—The boundary separating Danish and German waters is a line from Hejlsminde, in a northeast by east direction, indicated by two beacons, for nearly 1 mile, from which its direction is to the southeastward, passing ¾ mile southwest of Brandsö.

At about 1⅓ miles southwest of Ægholm, it turns to the south-southwestward, passing close eastward of Barden Ground, southward of which shoal its direction alters to south-southeast, to about ⅔ mile south by west of Bastholm, where it turns to the northward of east, passing close southward of Græsholm.

From Græsholm it has a southeast direction for 1⅓ miles, turning southwestward on the leading mark of Sandager Church and Aborre Minde Beacon to 1½ miles eastward of Aarö Kalv, then south by west over Nordlige Lille Ground, and so to the southward and southeastward, between Lang Ground and Alsen Stein, and Lyö and Alsen.

Directions.—Approaching the Little Belt, from a position with Ljus Hook Lighthouse bearing 337°, distant 1½ miles, steer 276° for 4 miles, or until Vestborg Lighthouse bears 34°, about 1½ miles, when alter course to 214° for 3 miles, or until Ljus Hook bears 56°, when steer 259° for 12 miles, or until Æbelö Lighthouse bears 152°, after which a course may be shaped for the entrance. Directions continued below.

Coast—Æbelö to Stavrs Head.—Stavrs Head is about 12 miles west-southwest of Æbelö, the land between receding about 3 miles; in the vicinity of Bogense it is flat and wooded in places. Baaring Bay is situated in the western part, and Stavrs Head, its northwestern point, is steep, 125 feet high, and wooded in places; southwestward of it the land rises to 233 feet.

The most conspicuous objects are Bogense Church and Baaring, Rögle, and Kathrineberg Mills, which three are all on high ground.

Depths offshore.—The shore bank westward of Æbelö extends about 800 yards within a depth of 3 fathoms, but between it and Bogense it is about 2¾ miles off and has some islets on it, of which Langö, Lindholm, and Store Stegö are connected with the coast, from the first-named, by an embankment.

A flat, with depths under ½ fathom, extends 2 miles westward of Langö, and 1¼ miles northeast of Store Stegö is Skinfel, a rock with a depth of 1¾ fathoms. Bræmsen, a shoal with ¾ fathom, lies 1¾

miles eastward of Skinfel, and nearly 2 miles northward of Bræmsen is a patch of 2¾ fathoms just within the 5-fathom contour line.

Bogense Road lies between Bogense and the northeast side of Baaring Bay, and on the shore bank, westward of Bogense, is Holmen, on which the depth is ¾ fathom. About 1 mile northward of Holmen is a patch of 2¾ fathoms.

Fogsand, on the northeast side of Baaring Bay, extends nearly 1¼ miles from the shore, with depths under 3 fathoms, but the shore bank of Baaring Bay is narrow, the 4-fathom line being from 300 to 400 yards offshore.

On the northeast side of Stavrs Head is a little rock with ¾ fathom within the 2-fathom contour line. The bottom of the shore bank is composed of sand, stones, and weed in spots.

Buoy.—A red spar buoy, surmounted by an upturned broom, is moored in a depth of 1¾ fathoms northeastward of Holmen.

Bogense Harbor consists of two breakwaters which extend in a northwest direction parallel to each other and about 70 feet apart for a distance of 600 yards. They then bend to the northward for about 100 yards, the entrance, facing north, being about the same width as the harbor. There are gas works and lime works on the southwest breakwater, with a chimney 52 feet high.

The harbor and the channel leading to it have been dredged to a depth of 15 feet, but gales from northwest to northeast raise the level, and those from opposite directions lower it about 5 feet: the ordinary rise and fall is 1¾ feet. Work is to be commenced to enlarge and deepen the harbor.

Lights.—A fixed red light is exhibited, at an elevation of 20 feet, from a pole, 23 feet in height, on the northeast pierhead.

Two fixed white leading lights, exhibited from a white beacon and a post, respectively, and which are in line bearing 165°, are shown when steamers are expected and lead eastward of Holmen.

Pilots can be obtained and pilot vessels to Fredericia, Middelfart, Kolding, Vejle, Horsens, Odense Fiord, Kallundborg, Samsö, Aarhus, and Kjerteminde.

Beacon.—A square white beacon 10 feet in height is situated on the beach close eastward of the harbor.

Buoy.—A white buoy with a straw wisp is moored on the eastern side of the northern end of the outer dredged channel.

Directions.—Coming from the northward, a high chimney in the western part of Bogense in line with the white beacon near the beach, bearing about 177°, leads close eastward of the spar buoy, northeast of Holmen, and when it is passed keep to the southwestward, with Baaring Mill between the second and third houses, from the westward, on Fogense Point, about 226°; Baaring Mill, situated 7 miles southwest of Bogense, can not always be distinguished, and

in the event of this steer a little northwestward of the breakwater heads.

Anchorage may be obtained about 400 yards north by east of the harbor entrance, on the leading mark of Baaring Mill, between the second and third houses on Fogense Point, but north and northeast winds set in a heavy sea, and the current, under such conditions, often sets against the wind.

Town.—Bogense is the northernmost town in Fyen. There is a railway to Odense, the station being close to the harbor, where are also post, telegraph, and telephone offices. Supplies of fresh provisions may be obtained and water from a pipe.

Baaring Bay, between Fogsand and Stavrs Head, has depths of from 6 to 9 fathoms, over clay and mud; its southwest corner is named Flaske Bight, and the deepest water is near Stavrs Head. It affords good anchorage with offshore winds.

Mole.—A shelter mole in Baaring Bay is 230 feet long, a gangway pier, 558 feet, connecting it with the shore; it has a depth of 8 feet alongside.

Vejle Fiord, entered westward of Björnsknude, on west side of the northern part of the Little Belt, extends from Trælle Næs, its southern entrance point, for a distance of 12 miles, in a west by north direction, to the town of Vejle.

The land is high and wooded on both sides of the fiord, except near Björnsknude. Hölsminde, 4 miles westward of Trælle Næs, is at the entrance to Rands Fiord, which has been partly reclaimed, and has an embankment ½ mile inside its entrance; Hvidbjerg, about ½ mile northward of Hölsminde, is a very conspicuous white sandhill.

On the northern side of the fiord the most conspicuous objects are Klakring, Barrid, and Vrigsted Churches, and about midway between Björnsknude and Rosenvold Point is Barridskov house, while on the latter point is Rosenvold mansion house. Stovby mill, on a 260-foot hill, and Engom Church, of red brick, are also marks on the north shore.

Vejle Fiord Sanatorium and Træsko Hook Lighthouse are on the north side, and at the head of the fiord are Vejle and Bredsten Churches.

On the south side is Brejninge Lunatic Asylum and Trælle Mill.

North shore.—Rosenvold Point is 7½ miles westward of Björnsknude, and between these points the shore bank, to the 3-fathoms contour line, does not extend more than ¼ mile.

From Rosenvold Point the coast trends in a west-northwest direction for 2½ miles to Træsko Hook, and between the shore bank is narrow and comparatively steep-to, continuing so for a distance of about 5 miles northwest and west of Træsko Hook.

Light.—On Træsko Hook is a white tower, 40 feet in height, with a brown roof, which exhibits, at an elevation of 43 feet above high water, a fixed light, with white, red, and green sectors, visible, respectively, 10, 7, and 5 miles. (For bearings of sectors, see Light List.)

Rosenvold Hook is a small sandbank which extends for about ⅓ mile in a southwest direction from Rosenvold Point, and from Træsko Hook a similar bank extends for about the same distance; both are steep-to.

Buoys.—Rosenvold Hook is marked on its south side by a conical red buoy, surmounted by an upturned broom, and Træsko Hook is marked by a similar buoy, but with two upturned brooms as a topmark; the buoys are in depths of 7 and 5 fathoms, respectively.

Rosenvold boat harbor.—About 800 yards northward of Rosenvold Point two small breakwaters extent for about 130 feet westward and then a similar distance west-northwestward, inclosing a boat harbor having depths of from 4 to 6 feet, but the level is raised and lowered 3 feet by winds from north and south, respectively. There is a railway station at Barrid.

South shore—Trælle Næs is a tongue of land the point of which is named Kasserodde; it is the southern entrance point to Vejle Fiord.

Kasserodde, extending from the foot of the bluff, which is the termination of the high land of Trælle Næs, is low but unmistakable, as on its extremity are three trees, forming a conspicuous clump, and other somewhat similar clumps are scattered along it.

Kasserodde Flat, with depths under 3 fathoms, extends for a distance of 1½ miles eastward of Kasserodde, the 5-fathom contour line being nearly 2 miles off; a large rock, with 5 feet water over it, lies on the flat, 800 yards from Kasserodde, and the northern side of the flat breaks down steeply to 7 fathoms.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 4 fathoms eastward of Kasserodde Flat.

The wreck of the yacht Doris lies sunk in 9 fathoms of water about 3 miles eastward of the flat. A buoy is moored about 109 yards northward of the wreck.

Holtser Hook, 7½ miles west-northwest of Trælle Næs, is grassy, with a few trees, and high, except where it extends to the northward in a low spit; it has wooded hills on each side of it.

Buoy.—A white can buoy, surmounted by a down-turned broom, is moored in a depth of 4½ fathoms, on the northeast edge of the spit off Holtser Hook.

Depths offshore.—The shore bank westward of Trælle Næs to Holsminde is not more than a quarter of a mile in width, but off Hvidbjerg and Mörkholts Hook it stretches off ⅔ mile; Prinds Frederiks Ground consists of some shoals of hard sand with a least depth

of 1½ fathoms ½ mile off the coast, but between this and Holtser Hook, 3½ miles northwestward, the shore bank is again narrow.

A small sand spit extends northward of Holtser Hook, and westward of it is Andkjær Bay, which has a shore bank about ⅓ mile in width.

Depths.—Close along the coast, eastward of Rosenvold Point, is a small channel, with depths of from 10 to 11 fathoms, but the remainder of the outer part of the fiord has from 7 to 9 fathoms; a tongue of the deepest water extends along the south side from Prinds Frederiks Ground toward Bregning Head, and northwest of that the depths are from 4 to 5 fathoms.

For a distance of about 2½ miles from the head of the fiord, it is filled by shallow water, through which is a dredged channel. The bottom of the fiord is soft, being composed of mud and ooze, but westward of Holtser Hook it has a good deal of weeds; on the shoals it is hard sand, with rocks in places.

Anchorages.—There is anchorage all over the fiord, and small vessels lie between Björnsknude and Strandhuse, where there is a depth of 3 fathoms, over clay. Large vessels can anchor westward of Rosenvold Point, but the bottom being soft, the holding ground is not good, and they will find the best anchorage in Andkjær Bay, westward of Holtser Hook.

Off Tyrsbæk, on the north side, there is a depth of 4 fathoms about 600 yards offshore.

Directions.—The fiord being clear of outlying dangers, it is only necessary to keep in the middle until nearing the entrance to the dredged channel.

To pass eastward of Kasserodde Flat in a depth of 4½ fathoms, Barrid Mill should be kept in line with a little bush between Sönderskov and Österskov, bearing about 347°, and leaving the red buoy on the port hand, and to lead northward of the same shoal, Trælle Mill should be well open north of Trælle Cliff, which is situated 1 mile westward of Kasserodde, 253°.

The white sand of the shoal southward of Rosenvold Point generally shows, but if it is not seen a bushy hummock on the backland north of Vejle in line with the north edge of Holtser Hook Wood leads southward.

A vessel will pass northward of the spit extending northward of Holtser Hook by keeping Vejle Church in line with the south edge of Nörreskov, on the north side of the fiord.

By night the sector of fixed white light from Træsko Hook between the bearings of 293° and 296° leads northward of Kasserodde Flat and southward of the shoal south of Rosenvold Point and the

fixed white sector on the west side, between 111° and 117°, leads northward of the spit extending northward of Holtser Hook.

Piers.—The following piers extend from the shores of the fiord:

Fakkegrav on the north, between Rosenvold and Træsko Hook, has a pier 295 feet in length, with a depth of 8 feet at its head; there are daily steamers from this pier to Vejle.

Near Brystsyge Sanatorium is a pier, 394 feet in length, with a depth of 9 feet at its head.

A pier southward of Davgaard Tile Works is 246 feet in length, and has from 10 to 11 feet at its head; there is good anchorage in a depth of 2½ fathoms off this pier. Another pier near it, at which the daily steamers from Vejle call, has a depth of 10 feet.

At Munkbjerg, on the south side of the fiord, a pier, 295 feet in length, with a depth of 10 feet at its end, extends from the marine hotel.

Vejle Harbor, at the head of the fiord, is 1,100 yards in length, in a west by north direction, and at its entrance, on the north side, is the Svajebassin, or Swinging Basin, 800 feet in length and 330 feet in width, to facilitate vessels turning, but the space is limited for some vessels; the remainder of the harbor, to its head, is 160 feet in width. On the south side of the entrance is a boat harbor.

Dredged channel—Depths.—The harbor is approached through a dredged channel 1,650 yards in length in a 275° direction, which then trends 288° for a farther distance of 1.3 miles, with a reputed breadth of 82 feet, which is reported not to exceed 60 feet and a depth of 3 fathoms, there being the same depth in the harbor; in the Svajebassin there are depths of from 13 to 16 feet, and in the boat harbor 12 to 15 feet.

The usual rise and fall is about 2 feet, but during gales from northwest to northeast the rise is sometimes increased by 5 feet, the lowest level being the same below the daily fall with gales from southwest; all winds from the southward lower the level.

Lights.—At the head of the harbor a fixed green light is exhibited at an elevation of 26 feet above high water from an iron frame 19 feet in height.

Two fixed red leading lights are shown at elevations of 53 and 20 feet, the rear light from a white mast and the front light from a white beacon; they are in line bearing 288° and 570 yards apart.

Buoyage.—The north side of the channel is marked by red buoys and the south side by white buoys, the latter sometimes surmounted by down-turned brooms.

Pilots for the fiord and the harbor may be obtained at Holtser Hook and live at Vinding, 2 miles from the town, on the south side of the fiord; five tugs are available.

Ice.—Average ice conditions. (See Appendix.)

Town.—Vejle, at the head of the harbor, is an old town, with a population of 17,105 in 1910, and is celebrated for its pretty environs; it has three churches, the most conspicuous one from the fiord having a red brick spire, and there are also several chimneys in the town.

Communication.—A regular service of steamers connects with Copenhagen, and it is on the line between Frederikshavn and Vamdrup, with railway communication with Copenhagen, via Fredericia, and a ferry to Strib Point; the railway station, post, and telegraph offices are about ¼ mile from the harbor.

Coal and supplies.—A small supply of coal might be obtained, fresh provisions are plentiful, and water may be procured at several places around the harbor.

Patent slip.—There is a patent slip 300 feet in length over all, with depth on blocks of 7 feet at H. W. O. S. and a lifting power of 300 tons.

Repairs.—Some small repairs might be executed, there being three machine shops and an iron foundry; a crane on the southern wharf will lift 6 tons, and there is also a traveling crane lifting 1½ tons.

Time signal.—A time signal is given daily at 1h. 0m. 0s. p. m., mid-European time, at the telegraph office. (See Chapter I.)

Fishery area.—Five white poles, each surmounted by triangle, mark a fishery area eastward of the harbor.

Trade.—The chief export is agricultural produce, and import feeding stuffs; beer, spirits, cotton and wool, cloth, margarine, and yeast are manufactured.

Tragten (The funnel) is the entrance to the Little Belt, where it narrows, between the Stavrs Head and Strib Point, on the south, and Trælle Næs and Fredericia, on the northwest side.

Gunnery practice is carried on between Skanseedde and Vesterskov, about 3 miles northeastward, and although firing is discontinued while vessels are passing, it is desirable that they, or boats, should not remain in the locality situated within 1¾ miles of the practising ground longer than is absolutely necessary.

Two signal staves are placed on the incline, near the practicing ground, and two wicker-work balls will be hoisted on one or both of these when firing is proceeding.

Fyen Shore.—From Stavrs Head to Rögle Cliff the land falls steeply to the sea, and then becomes lower and level to Strib Point, where it is about 40 feet high; the shore bank is from ¼ to ⅓ mile off, until nearing Strib Point, where it is close-to.

Strib Point is low, and, except near the lighthouse, is well wooded; the light-tower, particularly with the sun behind it, is not easily distinguished until close-to.

Light.—Near the extreme of Strib Point is a rectangular white tower, 69 feet in height, with a gray roof, which exhibits, at an elevation of 69 feet above high water, a fixed light, having white, red, and green sectors, visible, respectively, 14, 11, and 9 miles. For bearings of sectors, see Light List.

At Strib Point Steam Ferry Harbors, when ferry steamers are expected, red leading lights are shown leading to the ferry berths, a red light is shown and a fog bell sounded at the east side, and a green light on the west mole head of the North Harbor; a red light is shown and a fog triangle sounded on the east side and a green light on the west mole head of the South Harbor.

Pier.—About 200 yards eastward of Strib Point is a pier with a depth of 10 feet at its outer end.

Jutland Shore.—From Trælle Næs the coast trends in a southwest direction, for a distance of 5 miles to Skanse Point; the shore bank, southwestward from Kasser Point Flat, extends ½ mile in places to the 3-fathom contour line, and 2 miles southwest of Kasser Point a 3½-fathom patch lies about 1,000 yards off-shore, while at 3½ miles from the same point is Gryde Ness Bank, nearly ½ mile in length, parallel to and 1,200 yards off the coast, with depths of 3 fathoms.

A tongue of shoal with depths under 2 fathoms extends 600 yards southeastward of Skanse Point.

Buoy.—The southeast extreme of the shoal from Skanseodde is marked by a conical red buoy, surmounted by an upturned broom in 2 fathoms water.

Snevringen is the channel of the Little Belt between Skanseodde and Stenderup Hook.

Fredericia Approach.—Approaching Fredericia from the northward the town is almost completely hidden by trees, and the only objects indicating its position are the tops of some chimneys, a mill, and a very conspicuous water tower.

The water tower, which is cylindrical in shape, is white with gray battlements; it is situated on the old ramparts, on the northwest side of the town, but its upper part only is seen above the trees.

A large mill stands near the shore on the east side of the harbor.

Fredericia Harbor, 830 feet in length in a northerly direction, with a breadth of about 200 feet, is fronted by a breakwater which, from the eastern side, extends in a westerly direction for about 750 feet, with an entrance facing the west 70 feet in width: westward of the entrance are the steam ferry harbors and a boat harbor.

The quays, built of stone and cement, have granite mooring posts and the depths alongside them vary from 12¾ to 17¼ feet: the railway runs parallel to the sides of the quays, which latter are lit by electricity.

The depth in the harbor entrance is 3¼ fathoms and 3 fathoms inside; in the boat harbor there is from one fathom to 1½ fathoms, but winds between north and east raise the level 4 feet, and those from south to southwest lower it about the same.

Lights.—A fixed white and red light is exhibited, at an elevation of 19 feet above high water from an iron standard 13 feet in height, and situated at the wharf on the west side of the entrance shows white over the harbor; red elsewhere.

From the south molehead there is shown a fixed light with white and green sectors. It shows white over the harbor and green elsewhere.

At the east steam ferry harbor, when ferry steamers are expected, red leading lights are shown leading to the ferry berths, a red light is shown and a fog siren sounded on the west mole, and a green light on the south mole of the boat harbor. At the west steam ferry harbor, when ferry steamers are expected, red leading lights are shown leading to the ferry berths, a green light is shown on the east mole head, a red light on the outer dolphin on the west side, and a fog bell sounded on the west mole.

Buoy.—An iron buoy lies 200 yards off the harbor in a depth of 8 fathoms.

Pilots, who can be obtained from the town, pilot vessels north through west channel to Frederikshavn, and through east channel to the Skaw, eastward to Odense Fiord and the Sound; and south through the Little Belt to Eckernförde and through the channel south of Fyen to Svendborg Sound.

Directions.—Large vessels may pass nearly in mid-channel between Gryde Ness Bank and the shore bank, which extends between Stavrs Head and Rögle Cliff, in a depth of 7 fathoms, by keeping the farmhouse with a yellow gable, southwestward of Fredericia, in line with Strib Point, or in not less than 40 feet with Strib Point bearing 236°, until Erritsö Mill bears 259°, when Skanseodde can be rounded and Fredericia steered for. Continued below.

Current.—The current off the harbor is an eddy setting almost continually to the eastward and caused by the south-going stream, which, entering the narrows, strikes the coast beyond Fredericia and turns back in an easterly direction. When the north-going current is running it follows the direction of the coast.

Anchorages.—The anchorage for large vessels of Fredericia is in from 10 to 12 fathoms water, and for small vessels in from 8 to 10 fathoms, but with strong northerly winds a vessel is liable to drag off the bank, and with northeast winds it is somewhat unsafe, owing to the short and irregular sea, formed by a northeast-going current and to the swell setting in around Skanseodde.

Small vessels can find good anchorage in a depth of 2 fathoms about 1,200 yards westward of the entrance to Fredericia Harbor and out of the current, with Stavrs Head a little open of Skanseodde, bearing 94°, and Vase Mill well open westward of Fredericia outer ramparts, about 2°.

Ice.—Average ice conditions, see Appendix.

Town.—Fredericia, situated at the point where railway ferries connect the main line between Jutland and Fyen, has some importance, which, however, is lessened by the proximity of Kolding. The population was 14,257 in 1910.

Communication.—There is a regular service twice weekly by a small steamer between Fredericia and Copenhagen, calling at Middelfart and Kolding, also a fortnightly steamer to Hamburg. A powerful steam ferry takes a portion of the train across the belt to Strib 12 times daily. The railway station, post, and telegraph offices are about 200 yards from the harbor.

Coal and supplies.—From 10,000 to 15,000 tons of coal, coke, and briguets are kept in stock and about 42,000 tons imported annually. Coaling is carried on by wheelbarrows and baskets, alongside overhanging shoots. About 100 tons of liquid fuel are kept in stock.

Fresh provisions are plentiful, and water is laid on by pipes from the waterworks to the quays.

Repairs.—There is a machine workshop, and a crane will lift 8 tons.

Time signal.—A time signal is given daily at 1h. 0m. 0s. p. m., mid-European time, from the telegraph office. (See Chapter I.)

Tides.—It is high water, full and change, in Fredericia Harbor at 11h. 11m.; ordinary tides rise 16 inches.

Trade.—The exports consist of butter, eggs, and farm produce, and imports of coal, coke, patent fuel, corn, salt, timber, and stone.

The manufactures are beer, spirits, cotton spinning, linen, and tobacco.

Submarine telegraph cables.—A telegraph and a telephone cable cross the Belt from Fredericia to Strib Point; the telegraph cable is marked on each side by beacons. (See Chapter I.)

Jutland Shore—Fredericia to Lyngsodde.—Westward of Fredericia a park extends close along the shore, and southward of it Erritsö Mose, a marshy valley, with Erritsö Village further south, and Erritsö Mill between it and the coast, which latter is about 60 feet high to the southward. Erritsö white church is only visible from certain directions.

The shore bank, which is close to the coast along the south side of Fredericia, extends in Mölle Bight, the bight to the westward, about a quarter of a mile off; between Mölle Bight and Lyngsodde the shore bank narrows, and is steep-to, breaking down abruptly to 22

fathoms in places. Southward of Lyngsodde a small shoal of 4½ fathoms lies 400 yards off the coast.

Lyngsodde Pier, extending 53 feet from the shore, about 500 yards northward of Lyngsodde, has a depth of 14 feet at its extreme.

Telephone cable.—A telephone cables crosses from Lyngsodde to stavnby.

Fyen shore—Strib Point to Gals Cliff.—From Strib Point the coast curves round from a south-southeast direction to south-southwest and west-northwest, for a distance of about 5 miles, forming the east and south sides of Snevringen, and is alternately high and low, and wooded in some parts.

The conspicuous objects are Strib Railway Station and Ferry Harbor southeast of the point; a tall chimney of Nymölle Tileworks and Nymölle, eastward and east-southeastward of Middelfart, which town, with its church of weathered red brick and square tower, forms a good mark; a water tower near the hospital, south by west of Middelfart, is also noticeable.

Reef.—A reef extends about 200 yards northwestward of Strib Point, and from a depth of 2¾ fathoms, breaks down abruptly to between 7 and 9 fathoms.

Shore bank.—The shore bank from Strib Point gradually increases its breadth, and between Rudbæk and Skjærbæk it is fully 300 yards from the shore, with depths under 3 fathoms; southwest of the latter it decreases in breadth, and from Middelfart to Gals Cliff it is close to the shore and steep-to.

About 1,200 yards south-southeast of Strib Point a small shoal with a depth of 2 fathoms lies 300 yards from the coast and outside the 5-fathoms contour line.

Strib ferry harbor has a small breakwater extending about 400 feet in a northwest direction on its southwest side, the entrance facing northwest being about 115 feet in width; the depth in the harbor are about 13 feet.

A similar ferry harbor lies close southeast of it.

Anchorage may be obtained in depths of from 6 to 7 fathoms southward of the Ferry Harbors; the bank is moderately steep-to, and with northeast winds it is a better anchorage than off Fredericia, there being less swell.

Middlefart Harbor is formed by a breakwater 580 feet in length in a west by north direction, parallel to the shore, the space between being about 130 feet, and the entrance, formed between the breakwater end and a short mole extending northeastward, about 60 feet in width; the area is about 1¾ acres.

The depths in the entrance and in the harbor are from 14 to 15 feet, but gales from between east and northeast raise the level 4 feet,

and those from west to southwest lover it 3 feet; on the north side of the pier the depths are from 14 to 17 feet.

Light.—From a square gray hut 19 feet in height, situated on the end of the mole, at the south side of the entrance, a fixed red light is exhibited at an elevation of 18 feet above high water, but it is only shown from August 1 to May 1.

Pilots can be obtained, and take vessels from Fredericia to Assens and Aarö Sound; a warping buoy is moored eastward of the harbor.

Current.—There is generally an eddy with the north-going current, and the stream usually set northwest along the north side of the breakwater and at the entrance.

Town.—Middelfart is a town with 5,000 inhabitants.

Communication.—The steamer between Fredericia and Copenhagen calls weekly, and a railway connects the town with Strib, and so with Fredericia and Jutland lines; a line also runs to Nyborg. The post and telegraph offices are near the market.

Coal and supplies.—About 5,000 tons of coal are kept in stock and water from the town waterworks is brought to the harbor.

Kongebro, nearly midway between Middelfart and Gals Cliff, has a small boat harbor with a depth of 5 feet.

Submarine telegraph cable.—A cable crosses the Little Belt from Kongebro to Snoghöj, its direction being marked on Fyen by two telegraph beacons. See Chapter I.)

Jutland side—Lyngs Odde to Börup Sand.—From Lyngs Odde the coast of Jutland trends in a west by north direction for 2 miles to East Börup and then turns to the southwestward for 1½ miles to Börup Sand, and between Lyngs Odde and Snoghöj it is moderately low, but becomes higher, with steep slopes as far as Damgaard, which may be known by a high light-colored building with several woods round it. Damgaard mill is close to the beach.

Other conspicuous marks are: The chimney of Lyngs Odde Tile Works; Tavlov Church, white, with a square tower and pointed slate roofs, which stands high above the trees and is seen immediately after rounding Lyngs Odde; and the tall chimney of Börup Sand Tile Works.

Shore bank.—Between Lyngs Odde and Börup Sand the shore bank close to the coast is steep-to; abreast of Damgaard the 10-fathom contour line extends about ⅓ mile.

Snoghöj boat harbor, about 1 mile westward of Lyngs odde, has a depth of 5 feet; close outside the pier there is 8 feet, deepening suddenly to 16 feet. Northerly winds raise and southerly winds lower the level about 4 feet. There is a well near the harbor.

East and West Börup—Lights.—East Börup Light, situated 1¼ miles west by north of Snoghöj, is a fixed light with white, red, and green sectors, exhibited at an elevation of 30 feet above high

water from the gable of a white dwelling, 26 feet in height, with green window sashes and a slated roof; the lights are visible, respectively, 10, 9, and 7 miles.

West Börup Light, about 800 yards westward of the preceding, is a fixed light, with white, red, and green sectors, exhibited at an elevation of 11 feet above high water from the gable of a green dwelling, 29 feet in height; the lights are visible 8 miles. For bearings of sectors of both lights, see Light List.

Directions.—Coming from the northward and proceeding through Snevringen, steer for Erritsö Mill, bearing 259°, until Strib Point Lighthouse bears 169°, distant ½ mile, when edge to the southward to steer about 184°, observing that Middelfart Church open westward of Lyngs Odde Tile Works, bearing 199°, leads westward of the shoal water westward of Strib Point, in a depth of 5 fathoms.

Having passed Strib Point, Nymölle may be steered for about 184°, or bring Strib Point Lighthouse to bear 11°, and use it as a stern mark, steering 191°, and when Gals Cliff is open southward of Lyngs Odde 274°, the latter point may be rounded, taking care, in a deep-draft vessel, to avoid the 4½-fathom patch southward of it, and steer westward and southwestward in mid-channel.

By night.—After passing Strib Point, the sector of fixed white light from that lighthouse, bearing between 12° and 15°, leads in the channel past Lyngs Odde, and to the fixed white sector from West Börup Lighthouse, between 288° and 291°, which leads through the channel northward of Gals Cliff; the fixed white sector from East Börup Lighthouse between 27° and 36°, leading in mid-channel between Börup sand and Flessingen. Directions continued below.

Anchorages.—A vessel can anchor on the bank, southward of Lyngs Odde, in depths of frou 6½ to 7½ fathoms, about 300 yards offshore, with Strib railway station in line with Lyngs Odde, bearing 27°.

Lödver Odde to Stenderup Hook.—From Lodver Odde, the southern entrance point to Kolding Fiord, the coast of Jutland trends in a southeast direction for 3½ miles to Stenderup Hook, and is moderately low, the greater part being wooded. Böge Head, a conspicuous yellow cliff, is situated about ½ mile northwest of Stenderup Hook.

Shore bank.—The shore bank on this stretch of coast is narrow, and, except between Lödver Odde and Röns Head, is free from outlying dangers, but about midway between those points is a patch of 1¼ fathoms, foul with rocks, lying 300 yards offshore, and northeast of it is a shoal of 4 fathoms.

The shore bank extends about 600 yards southeast of Stenderup Hook to the 3-fathom contour line.

Buoy.—A conical red buoy, surmounted by an upturned broom, marks the eastern side of the shore bank southeast of Stenderup Hook.

Blomgaards Pier.—A pier, about 215 feet in length, with a depth of 14 feet at its extreme, and having a tramway on it, is situated about ½ mile southeast of Röns Head.

Fyen shore—Gals Cliff to Gamborg Fiord.—The land about Gals Cliff is wooded, the woods stretching south to Hindsgavl Mansion House, which may be seen from certain directions; from Hindsgavl to Öxner Odde the coast is steep.

The coast trands eastward for about ¾ mile and turns to the southward for a similar distance, forming Teglgaards Bight.

Shore bank.—The shore bank is generally narrow, but westward of Hindsgavl in Slots Bank, extending nearly 200 yards, and at the head of Teglgaards Bight the shore bank is ¼ mile offshore.

Fænö, about 1¾ miles in length, in a north-northwest and opposite direction, and nearly 1 mile in greatest width at its southern end, lies in the southern part of Snevringen, dividing it into two channels, the principal one being between it and the Jutland Coast.

Fænö Sound, between it and Fyen, is also known as Öjenæs Sound, Troldslykke, or Lille Sound. The coasts of the island are chiefly composed of cliffs and bluffs, and the north and south ends are wooded; near the center of the island is a mill 127 feet high.

Light.—On the south end of the island a fixed light, with white, red, and green sectors, is exhibited at an elevation of 35 feet above high water from the gable of a white dwelling 26 feet in height; the lights are visible 11, 11, and 9 miles, respectively. (For bearings of sectors see Light List.)

Dangers.—The shore bank surrounding the island is not broad, but breaks down steeply from a depth of 2 fathoms, especially between the north and northeast points.

Fænö Tange, or Gehr Hook, extending for a distance of 600 yards in a northwest direction, from the north end of the island, is composed of hard sand and has 5 fathoms close-to.

At Sten Head, on the west side, the shore bank is also of hard sand and steep-to, with 9 fathoms close-to, and on the south side the bank, also steep-to, extends for ¼ mile within the depth of 5 fathoms.

Tyven and Dynen are two rocks lying on this latter bank.

Fænö Kalv, a small grass-covered island, lying between the northwest side of Fænö and Jutland, has a narrow shore bank surrounding it which is steep-to.

Flessingen, a detached bank, nearly 1 mile in length, in a north by east and opposite direction, and about 400 yards in greatest width, within the depth of 3 fathoms, lies between Gals Cliff and Fænö Kalv; the least normal depth of 8 feet, on the center of the bank, is

sometimes reduced to 5 feet by the strong current, but it returns to its original depth.

The shoal is moderately steep-to on all sides except the southern, where a bank with depths under 5 fathoms connects it with Fænö Kalv, and on its east side, where a bank with 3¼ fathoms extends in a southeast direction toward the north side of Fænö Tange, and has a patch of 1¼ fathoms at its extreme.

Nearly 2 cables north by east of Flessingen is a patch of 2¼ fathoms.

Buoy.—A white can buoy, surmounted by a down-turned broom, is moored in a depth of 1¼ fathoms, near the shoalest part of Flessingen.

Channels—Depths.—The southwest channel, passing westward of Flessingen, southwest of Fænö Kalv and Fænö, and along the Jutland coast as far as Stenderup Hook, has a depth of 28 fathoms, west of Flessingen; from 12 to 23 fathoms west of Fænö Kalv, and southwest of Fænö, it attains a depth of 37 fathoms.

Fænö Sound, passing between Fænö and Fyen, has from 8 to 18 fathoms in mid-channel, and the sides may be approached to a distance of 200 yards.

Directions—Southwest channel.—After passing Gals Cliff, a vessel proceeding through the southwest channel may either use the channel eastward or westward of Flessingen and Fænö Kalv, but the former requires local knowledge, and the latter is that generally used by large vessels.

From the eastward, Skare Odde in line with Börup Sand, bearing 241°, leads to the northward of Gals Cliff and when Stenderup Hook is just open of Sten Head, the west point of Fænö, 161°, steer 191°, passing westward of Flessingen and Fænö Kalv, and from abreast the latter a 135° course should lead in mid-channel.

A vessel will pass northeastward of Stenderup Hook in a depth of not less than 9 fathoms by keeping Tavlov Church, half the breadth of Fænö Kalv, eastward of that island, bearing 325°, or Skjærbæk Mill in line with the highest part of Fænö Kalv, 323°, and the shoal will be passed when Middlefart Church is just open eastward of Sydköjs Hook, the southeast point of Fænö, 16°.

Through Fænö Sound.—To lead between the 2-fathom patch and the shore bank of Gals Cliff, Sten Head should bear 176° with Böge Head shut in, and when Espen Head bears 133°, with Nordköjs Hook, the east point of Fænö, shut in, it will lead westward of Slots Bank, and after passing Hindsgavl keep in mid-channel.

Tavlov Church in line with Espen Head, bearing 311°, leads southwest of the shoal extending from Öxner Odde, and the same church open twice its height above water of Espen Head, 310°, leads northeast of the shoal extending from Nordköjs Hook; a vessel will pass eastward of this shoal by keeping Adlerhus, a small, high-lying

building with a spire, situated ¼ mile southwest of Middelfart, in line with a small yellow house with a tiled roof, which is eastward of Hindsgavl Wood, bearing 354°.

When steering southwestward between Fænö and Föns Skov Odde, keep somewhat nearer to the latter to avoid the shore bank extending from Fænö.

By night.—The fixed white sector from East Borup Lighthouse, bearing between 27° and 36°, leads through the channel between Börup Sand and Flessingen, and into the fixed white sector from Klippe Hook, between 313° and 316°, which leads through the southwest channel. Directions continued below.

Anchorages.—There is anchorage for large vessels near Fænö Kalv, but that on the north side is not far from the track of passing vessels.

Between Börup Sand and Lödver Odde, in the entrance to Kolding Fiord, there is convenient anchorage, and also at the south end of Fænö Sound, the anchorage in Tegegaards Bight, in a depth of 7 fathoms, being the one most out of the current. The marks for it are Alderhus just open eastward of Hindgavl Wood, bearing 3°, and a wooded hummock on Espen Head in line with Öxner Odde, 300°.

Small vessels can lie on the southeast and southwest sides of Flessingen, but the current is strong at the former anchorage. A good temporary anchorage is in from 2 to 3½ fathoms on the outer part of Fænö Tange, which is out of the current.

Kolding Fiord, from its entrance between Börup Sand and Lödver Odde, extends for a distance of 5 miles to Kolding, and is about ¾ mile in width at its entrance, narrowing to ⅓ mile at half its length, and then expanding to about 1 mile westward of Börup Sand; on the north side Gudsö Creek, nearly dry, extends about 2 miles in a north-northwest direction.

The most conspicuous objects are Tavlov Church, already mentioned as forming a leading mark, and on the south side Olie Mill, situated on the southwest side of Agtrup Creek.

At the head of the fiord is the town of Kolding, with the high-lying ruin of Koldinghus Castle; Kolding Roman Catholic and Protestant Churches and Seest Church are also conspicuous.

The shore of the fiord on both sides is high, level, and wooded in places.

Light.—On the north side of the entrance about ¼ mile eastward of Klippe Hook and nearly 1 mile westward of Börup Sand, a fixed light, having white, red, and green sectors, is exhibited at an elevation of 46 feet above high water, from a gray dwelling 13 feet in height; the white, red, and green lights are visible 12, 9, and 9 miles, respectively. (For bearings of sectors, see Light List.)

North shore.—Drejens Odde, nearly 2 miles westward of Börup Sand, is the west entrance point to Gudsö Creek, which has depths under 3 feet, and a narrow channel running up its eastern side; from Drejens Point, the north side of the fiord, about from 100 to 120 feet high, trends in a westerly direction, for about 3 miles to the entrance to Kolding Harbor.

Buoys.—On the extreme of Kidholm Hook, about 600 yards southeast of Kidholm, an island in the middle of the entrance to Gudsö Bight, is a red spar buoy, surmounted by an upturned broom, and a similar buoy marks a shoal extending about 200 yards southeast of Drejens Point.

South shore.—Skare Odde is situated ¾ mile westward of Lodver Point, and 1¼ miles farther west is Löger Point, between which and Skare Point is Agtrup Creek, the shore bank, to a depth of 3 fathoms, nearly filling the bay, to a line joining the points, but on the west side is a portion of the deep channel leading to Kolding.

Westward of Löger Point the fiord is filled by shallow water, with depths between 3 feet and 2 fathoms, through which is a dredged channel.

Buoys.—A white spar buoy, surmounted by a straw whisp, marks the northern end of a shoal extending from Skare Point, and a similar buoy the shoal northeast of Löger Point.

Depths.—The depths in the outer part of the fiord are from 7 to 9 fathoms, shoaling to 5 and 6 fathoms, northward of Agtrup Creek, and to 4 and 5 fathoms to the entrance of the dredged channel, the bottom in the fiord being mud and clay, but in less depths than 3 or 4 fathoms it is mud and weeds.

Pilots may be obtained from Drejens Odde or from Kolding: they take vessels to Fredericia, Assens, and Aarö Sound.

Kolding Harbor, from its entrance between two broad moles, extends for a distance of 400 yards in a west-southwest direction to a svaje or swinging basin, about 400 feet square, and continues from it in the same direction for a farther distance of 550 yards to its head, its least width being about 130 feet.

Light.—An occulting green light, elevated 16 feet, is exhibited from a white conical tower with green band situated on the outer end of a short arm projecting to the southeastward from the head of the northern mole. For period of arc of visibility see Light List.

Leading lights.—From beacons surmounted by white triangles, one pointing upward the other downward on the north side of the two fixed red leading lights are exhibited at an elevation of 14 feet above high water and in line, bearing 267°, lead through the dredged channel.

Two fixed green lights are shown from poles on the north side of the harbor at an elevation of 16 feet above high water and in line, bearing 253°, lead to the swinging basin.

Dredged channel.—The harbor is approached by a channel 2 miles in length, which is dredged through the flat named Bunkerne, which fills the inner part of the fiord; the depth in the channel in the harbor entrance, and in the southern part of the swinging basin, is 23 feet, alongside the quays on the north side from 11 to 16 feet, and alongside the south side from 18 to 20 feet, but easterly winds raise the level 4 feet, and those from the westward lower it 3 feet. A new quay constructed in the southern part of the swinging basin has 23 feet water alongside it.

Buoyage.—The north side of the dredged channel is marked by 11 red spar buoys, the outer one surmounted by two upturned brooms and the remainder by one upturned broom; the innermost buoy on the south side is white spar with a straw wisp.

Directions.—A vessel from the northward, after passing Gals Cliff, may steer to pass close southward of Börup Sand, and when westward, bring it in line with Gals Cliff, bearing 69°, which, used as a stern mark, will lead in mid-channel to Skare Odde, when Olie Mill should be brought in line with the east side of the bush-covered portion of a cliff near the beach of Agtrup Creek, which will lead southeast of Drejens Odde to the entrance of the dredged channel.

Drejens Odde, bearing about 261°, with Koldinghus Castle Ruin shut in, leads northward of the shoals extending from Lödver Odde and Skare Odde in a depth of 3 fathoms.

Anchorages.—Large vessels can anchor in a depth of 6½ fathoms west-southwest of Böorup Sand, small vessels in from 2 to 3¼ fathoms in the bight westward of the same point: where weeds form a part of the bottom, the holding ground is not good.

There is also good anchorage in 5¼ fathoms on the flat extending northward of the bight between Lödver Odde and Skare Odde.

Town.—The town of Kolding, founded in 1248, has a considerable trade and has a population of 13,000; the ruins of Koldinghus Castle are interesting.

Communication.—There is regular steamship communication with Copenhagen and also by railway via the ferry from Fredericia. It is on the line between Frederickhavn and Vamdrup, the station being near the harbor as are also the post and telegraph offices.

Coal and supplies.—About 7,000 tons of coal are kept in stock; fresh provisions can be obtained, and water from the town water-works is laid on the quays.

Patent slip.—There is a patent slip length on blocks 100 feet breadth of entrance 32 feet, and lifting 150 tons.

Repairs.—Small repairs might be executed at three machine workshops; a standing crane lifts 6 tons and a traveling crane 1½ tons.

Time signal.—A time signal is made daily at 1h. 0m. 0s. p. m., mid-European time, from the telegraph office. (See Chapter I.)

Trade.—The exports are principally agricultural produce, and imports feeding stuffs and coal; there are manufactures of soap, chemicals, cheese, cement, tobacco, staves, butter casks, tallow, etc.

Fyen shore—Gamborg Fiord, which is a continuation to the southeastward of Fænö Sound, is separated from the Little Belt by Föns Skov Peninsula; Gamborg Church on the northeast side of the fiord, is somewhat conspicuous.

The depths in the fiord are from 5 to 7 fathoms as far as Torp Head, on the southwest side, above which they are from 3½ to 5 fathoms, shoaling to the head. The bottom is clay and ooze, except on the shore bank, where there are weeds.

Föns Skov Reef, a rocky reef almost dry, extends for 400 yards in a north by east direction from the extreme Föns Skov Odde. It is steep-to on the west side of its outer end, but slopes more evenly on the east.

Directions.—Hindsgavl principal building open eastward of Nordköjs Hook, bearing 323°, leads northeast of Föns Skov Reef, in deep water, and Nordköjs Hook, bearing 293°, with Espen Head shut in by it, leads, as a stern mark, up the fiord as far as Torp Head, in not less than 3 fathoms, and if proceeding farther Ronæs Pier should be steered for about 121°.

Ronæs Bro, a pier 400 yards in length, in a west by north direction, extends from the head of the fiord and has a depth of 10 feet at its extreme, but easterly winds raise the level, while those from the opposite direction lower it. A tramway runs on to the pier.

Coal and supplies.—About 500 tons of coal are kept in stock and fresh provisions and water may be obtained.

Coast—Föns Skov to Wedellborg.—Föns Skov Peninsula stretches in a northwest direction for 4½ miles, and Tönnes Odde, its southwest point, is steep, with a small cliff, from which the coast trends in an east-southeast direction for 3 miles, forming the north side of Föns Bay.

About midway on the north side of Föns Bay is Sparretorn wood and mansion house, and about ½ mile northeast of the head of Föns Bay is Föns Church, with Udby Church nearly 1 mile farther in the same direction. Both are painted white and have red pointed roofs.

Föns Bay, about ¾ mile in width, extends 1¼ miles east by south, and has from 6½ fathoms at the entrance to 3½ fathoms at the head, over muddy bottom.

Shore bank.—Along the northwest side of Fons Skov Odde the shore bank is narrow and steep-to, but to the southward it becomes

wider, and in the bight northward of Tönnes Odde and westward of that point it extends for 800 yards within the depth of 3 fathoms.

It is nearly that distance off to the southward of Tönnes Odde, but off Sparretorn and around the head of Föns Bay it is about 400 yards from the shore.

Aale Head Flat.—Aale Head is low, clear of trees from about ¼ mile from its extreme and then densely wooded, and Aale Head Flat extends for a distance of 1,600 yards westward of it to the 5-fathoms contour line; within 800 yards from the point are stony patches, with 1½ fathoms.

Tybrind Bay.—Wedellsborg Head is a peninsula about 1 mile broad, extending 2 miles westward and forming the south side of Tybrind Bay, about 2 miles in breadth across its entrance; in the inner part of Tybrind Bay is a shoal ⅜ mile in length, in a northeast and opposite direction, with depths of from 1½ to 2½ fathoms, and 3½ fathoms between it and the shore bank, which extends about 800 yards off in places.

About 1¼ miles within the extreme of Wedellsborg Head is Wedellsborg Mansion House, and 1½ miles farther east is Husby Church, which is conspicuous; the shore bank extends ½ mile westward of the point, but on the south side of the peninsula it is narrow and steep-to.

Wedellsborg Harbor consists of two boat harbors on the southeast side of a pier, extending for 300 feet in a southwest direction from the shore 1 mile southeast of Wedellsborg Head; in the outer harbor there are depths of from 4 to 7 feet, and in the inner 3 feet.

Water can be obtained from a house near the harbor, and there is a telegraph to Assens and a telephone office at Husby.

Jutland shore—Stenderup Hook to Hejls Minde.—From Stenderup Hook the coast trends to the southwestward for 4 miles, and then turns south-southeast for 2 miles to Vargaard Head, forming Mos Bay; from Vargaard Head it trends about south-southwest for 2 miles to Hejls Minde.

On this coast there are some considerable sized woods, westward of Stenderup Hook and Mos Bay; Vargaard Head is steep, with a yellow cliff, and a little more than a mile westward of Mos Bay is Skamlingsbanken, a conspicuous hill, 370 feet high, the highest part of a range, with a monument on its summit.

Vejstrup Church, with a spire, lies 1½ miles southwest of Skamlingsbanken, close northeast of Hejls Minde are several tile works, and on the tongue of land forming the north entrance point to Hejls Nor is a warehouse.

There is a small pier near Stenderup Hook.

Shore bank.—The shore bank, to the 3-fathom countour line, extends about 800 yards from the coast southwest of Stenderup Hook,

and round Mos Bay it is generally about 600 yards off, but on the north side of the bay, southward of Skibe Lund, a prong of shoal, with depths under 2 fathoms, stretches ⅔ mile in a southeast direction.

Southward of Vargaard Head the shore bank is about 800 yards off, and breaks down steeply from 1 fathom to 4 fathoms. The bottom on the shore bank consists of hard sand with weeds; in Mos Bay it is muddy, with weeds, and off Vargaard Head there are some parts rocky.

Hejls Minde is the entrance to Hejls Nor, a shallow lake only navigable by flat-bottomed boats, the channel being narrow, with depths of from 1 fathom to 1½ fathoms, but northeast winds raise the level 4 feet and those from southwest lower it about the same; the northeast side is marked by buoys and perches.

Tileworks pier.—About ⅔ mile northeast of the entrance to Hejls Nor is a tileworks pier, 500 feet in length, with a depth of 1½ fathoms at its outer end.

Communication.—The nearest railway station, post and telegraph offices, are at Kolding.

Boundary.—The boundary between Denmark and Germany is a line along the southeast side of Hejls Minde, which is prolonged in a southeast direction between Brandsö and the coast.

Flækojet, consisting of some large and small shoals, occupying a triangular space nearly 1¼ miles in length, in a north and south direction, the apex of the triangle being to the northward, and nearly 1 mile in width at its base, within a depth of 5 fathoms, lies fully 1 mile westward of Tönnes Point.

The patches, which consist of hard sand and weeds, with rocks on the western side, have depths of from 2¼ to 3½ fathoms over them; the channel between it and the Fyen Shore has from 16 to 20 fathoms, and that on the west side from 5 to 9 fathoms.

Buoy.—A conical red buoy, surmounted by two upturned brooms, is moored, in a depth of 6 fathoms, on the east side of Flækojet.

Bredningen, the expansion of the Little Belt, southward of Flækojet, has a narrow, deep channel extending into it from the eastern side of that shoal, otherwise the depths over it are fairly even, being from 7 to 10 fathoms on the east and from 4¾ to 6 fathoms on the west side.

The bottom in the deep channel is sand, and on both sides of Bredningen there is oaze, with mud over clay on the Jutland side.

Anchorages.—The whole of Bredningen affords anchorage, with good holding ground, and in Föns Bay and Tybrind Bay a vessel will be out of the current. In Mos Bay there is anchorage in from 4 to 4½ fathoms, over soft bottom, and in Hejls Minde, in the former depth, 600 yards from the shore off the tile works.

Directions.—From abreast Stenderup Hook a vessel can pass either eastward or westward of Flækojet, and, if using the western channel, Middlefart Church should be open of Sydköjs Hook, bearing 16°, and used as a stern mark, which leads close southeast of Stenderup Hook and west of a 2½-fathom patch of Flækojet, so that the church should be opened of the point near the former shoal and nearly shut in when passing the latter.

To pass eastward of Flækojet, when southward of Stenderup Hook, Tavlov Church should be brought in line with the east side of Fænö Kalv, bearing 327°, which, used as a stern mark, will lead in deep water between that shoal and Tönnes Odde.

When southward of Tönnes Odde, course may be shaped to pass on either side of Brandsö, observing that Tavlov Church kept midway between Fænö and Stenderup Hook, bearing about 326°, leads westward of Aale Head Flat in a depth of 6 fathoms, and Sparretorn its own breadth open westward of Aale Head, bearing 14°, leads westward of the shore bank extending from Wedellsborg Head; Assens Church, in line with the northeast point of Baagö, about 143°, leads southwest of the same bank in not less than 4 fathoms.

By night the sector of fixed white light from Fænö Lighthouse, bearing between 342° and 346°, leads through the channel between Flækojet and Tönnes Odde. Directions for Baagö Sound, Fyr Channel, and Aarö Sound, see below.

Brandsö, lying in the channel about midway between Wedellsborg Head and Hejls Minde, is about 1¼ miles in length in an east and west direction, and nearly 1 mile in width; it is somewhat low, is wooded on its northeast, has two farmhouses on its south, and a pier on its southeast side.

Shore bank.—The island is surrounded by a shore bank, which on its east and southwest sides breaks down steeply from 2 and 3 fathoms to 5 fathoms, but on the north and south sides it is broad, and from the former extends in a northwest direction for ¾ mile, within a depth of 5 fathoms.

Sæl Hook, a rocky reef, with rocks that dry extending 800 yards from the island, is eastward of the preceding shoal on the north side, and rocks extend off the south and east points, being 400 yards off at the former.

Anchorage.—The best anchorage for small vessels is in a depth of of 3¼ fathoms, off the boat harbor.

Directions.—A vessel will pass northward of the shore bank on the north side by keeping Husby Church just open north of Wedellsborg Wood, bearing 95°, and large vessels should not approach the southwest side of the island under a depth of 8 fathoms; Vejstrup Church in line with the first brick-kiln, northeast of Hejls Minde,

bearing 306°, leads through the channel between the island and Anslet Ground.

Brandsö Pier, on the southeast side of the island, is 246 feet in length, with a depth of 5½ feet at its outer end, but northeast gales raise the level 9¾ feet, and those from northwest lower it 5 feet.

Baago Sound—Fyen Shore.—From Wedellsborg Head the coast trends in an east by south direction for 3 miles, and then turns to the southward for nearly 5 miles to Assens, southward of which is Asnæs, a small peninsula, and another named Drejet, about 1½ miles farther south, off which lies Thorö.

Sönder Aaby Bight and Emtekjær Nor are situated in the northeast corner of the sound.

Of the conspicuous objects on this coast Husby Church has been already mentioned, and about 4 miles southeast of it is Barlöse Church, which stands moderately high and is painted white, with red roofs; Sandager Church, a low white building, with a pointed roof and slender spire, is farther south.

Assens Church, dark colored, has a high sharp tower, but the most conspicuous mark is a very high chimney near the Assen Sugar Factory, which may be seen when coming from the northward, after passing Flessinger Shoals, and there is another Chimney at Asnæs Salt Works, which is a red two-stored building; Kjærum Church, about 1¾ miles southwestward of Assens, also forms a mark.

Beacon.—About 2¼ miles northward of Assens is Aborre Minde Beacon, standing near the beach; it is a white tower, 58 feet high, surmounted by a red ball.

Leading lights.—At Tvinsbjerg, about 1½ miles northeast of Aborre Minde Beacon, two fixed white leadings lights, 2,362 yards apart, are exhibited and are in line when bearing 42°. The rear light is visible 6° and the front light 2° on each side of the leading line.

The rear light, exhibited at an elevation of 92 feet above high water, from a light brown dwelling 33 feet in height, is visible 15 miles.

The front light, shown at an elevation of 39 feet above high water, from the window of a white dwelling, 26 feet in height, is visible 11 miles.

From the same building as the front light a fixed light, with white, red, and green sectors, and visible 11 miles, is exhibited at an elevation of 39 feet above high water. (For bearings of sectors, see Light List.)

Shore bank.—With the exception of Sönder Aaby Bight, where the 5-fathoms contour line crosses that bay at a distance of more than ¾ mile off, the shore bank on this coast as far as Assens extends from

400 to 600 yards off within the depth of 5 fathoms, the bottom being hard sand.

Submarine telegraph cable.—From the coast, about 2 miles southeast of Wedellsborg Head, a cable crosses to the northeast point of Baagö, its direction being indicated on each side by two white telegraph posts, surmounted by triangles.

Assens Harbor consists of three basins, named, respectively, New Harbor, Old Harbor, and Inner Harbor, the first protected by a breakwater extending 650 feet in a southwest direction, and separated from Old Harbor by a mole 425 feet in length in a westerly direction; its entrance, facing southwest, is about 115 feet in width.

Old Harbor has an entrance, about 33 feet in width, southward of the mole, and Inner Harbor is entered by a similar-sized entrance from the south side of Old Harbor; this last harbor has a mole on its south and a breakwater extending about 400 feet in a northerly direction on its west side.

Leading lights.—Two fixed red leading lights, 450 yards apart, and in line bearing 161°, are exhibited at Assens; they show 2° on each side of the leading line.

The rear light, at an elevation of 36 feet above high water, is exhibited from a red structure, 33 feet in height, with a white band, situated southwest of the town, and is visible 11 miles.

The front light, shown at an elevation of 10 feet from a somewhat similar structure, but 14 feet in height, and situated on the southwest angle of the Inner Harbor, is visible 8 miles.

A fixed green light is shown between August 1 and May 1 from the mole end which separates New and Old Harbors.

Nearly 400 yards west-southwest of Assens sugar factory are two beacons 20 feet in height, in the form of an hourglass, the front red above and white below and the rear white above and red below; they exhibit at elevations of 15 and 26 feet above high water, respectively, two white fixed leading lights, which are in line bearing 172° and are shown when vessels are expected, to lead through the dredged channel.

Asnæs Reef, within a depth of 5 fathoms, stretches in a north-northwest direction for 1¾ miles from the extreme of Asnæs Peninsula, and on its inner part, for a distance of nearly 1 mile, has depths under 2 fathoms, from which it deepens gradually to 5 fathoms; the bottom consists of sand and weeds.

Buoy.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 3 fathoms, near the northern edge of that depth.

Dredged channel.—The harbor is approached through a dredged channel 105 feet in width and with a depth of 20 feet, there being the same depth near the quays in New Harbor; in Old Harbor and its entrance the depth is 16 feet, and in Inner Harbor 12 feet, but gales

from northeast to east, setting in after westerly winds, raise the level about 5 feet, and those between southwest and northwest lower it the same amount. The swinging place outside the harbor is 410 feet in width.

Pilots may be obtained in the town, and take vessels north to Vejle Fiord, south to Apenrade, and east to Dödmanden and Svendborg Sound. A tug may be obtained, and on the west side of the channel to the harbor are three warping buoys.

Directions.—The leading light structures by day or the red fixed lights by night, in line 161°, lead to the entrance of the dredged channel, through which the beacons by day or fixed white lights should be in line bearing 172° by night.

Assens Roadstead, between the coast north of Assens and Asnæs Reef, is protected from all winds except those from north, which send in some sea; the holding ground is moderately good. The anchorage, in a depth of 3½ fathoms, is with the high chimney of the sugar factory in line with a warehouse on the harbor mole, bearing about 159°, and off Mariendal, a conspicuous white house near the coast northward of Assens; smaller vessels can anchor closer in.

Town.—The town of Assens, which had a population of 4,461 in 1908, is favorably situated in a good trade district and has some importance. Its church has been mentioned as a conspicuous object.

Communication.—There is regular communication by steamers with Copenhagen, and during summer with Aarö Sound and Hadersleben; a railway connects the town with Tommerup, the station, as also the post and telegraph offices, being near the harbor.

Coal and supplies.—About 4,000 tons of coal are kept in stock, fresh provisions are plentiful, and water from the town waterworks is laid on the quays.

Slip.—There is a patent slip with lifting power of 50 tons.

Repairs.—Small repairs might be executed, and there is a crane at Old Harbor which will lift 6 tons.

Thorö, a small, low island, 11 miles southward of Assens, is separated from Fyen by Thorö Sound.

Thorö Reef, extending nearly 2 miles westward of Thorö to the 5-fathom contour line, for fully 1 mile from the island, is an even flat with from 1¼ to 1¾ fathoms over it; its general breadth, under a depth of 3 fathoms, is about 1¼ miles, the bottom being composed of sand and weeds.

A detached shoal, with a depth of 2¾ fathoms, lies ⅝ mile off its north side.

Buoy.—A white can buoy, surmounted by three down-turned brooms, is moored in a depth of 3¾ fathoms near the western 3-fathom edge of Thorö Reef.

Thorö Roadstead, the bay formed between the shore bank from Asnæs Peninsula on the east and that from Thorö on the west, affords good anchorage and holding ground. The depths are from 3¾ to 4½ fathoms. In the south part a sandy tongue of shoal, with a depth of 1¼ fathoms, extends northward from Drejet.

Thorö Sound, between Thorö and Dreget, has depths of from 3¾ to 6 fathoms, but is small and crooked, and on its south side is a bar, with 1¼ fathoms; small vessels of less than 9 feet draft and having local knowledge, pass through.

Directions.—The mark for leading into Thorö Roadstead is the west edge of Wedellsborg Wood open east of Baagö, bearing 336°, which, used as a stern mark, leads along the west side of Asnæs Reef in a depth of 3½ fathoms, and anchorage may be obtained on this mark, in a depth of 4¼ fathoms, with Assens Church, bearing about 57°.

Coming from the westward a small vessel may pass northward of Thorö Reef in a depth of 2¾ fathoms, by keeping Brahesborg, a conspicuous mansion house, with a red roof, 2 miles eastward of Assens, in line with Assens Church, about 73°.

Baagö, a low island 1¾ miles in length in a north and south direction, and 1¼ miles in width, lies about 2 miles southward of Wedellsborg Harbor, and the same distance westward of Aborre Minde Beacon; about the middle of the island is Baagö Church, small, and having a square tower, with a spire. On the southeast end of the island is a mill, and at the southwest point the lighthouse.

Light.—A square white tower, 26 feet in height, on the southwest point of Baagö, exhibits, at an elevation of 39 feet above high water, a fixed white light, visible 11 miles.

Landing Pier.—Baagö Pier is 100 feet in length, and has a head 50 feet in length by 30 feet in breadth, with a depth of 8 feet at its extreme; it is situated on the south side of the island.

Ægholm, a small grassy island, lies close to the northwest point of Baagö.

Dangers.—The shore bank surrounding Baagö extends about ½ mile from its east and west sides, but from the northwest point a flat, about 1 mile in width, stretches off for fully that distance to the 5-fathom contour line, and surrounds Ægholm; a shoal prong, with 2¾ fathoms, extends from the west side of the flat and ¾ mile from Ægholm. The shore bank extends about ½ mile from the eastern part of the north side of the island.

On the south side of Baagö the 5-fathom contour is 1½ miles from the island, and is known as Baagö Flat; it is mostly steep-to.

Sandhammeren, with depths under 1 fathom, stretches for 1,400 yards in a southeast direction from the southwest point of the island,

and breaks steeply down to Fyr Channel, the channel southwest of Baagö; the bottom on the shoals surrounding Baagö is hard sand.

Buoy.—A conical red buoy, surmounted by three upturned brooms, is moored in a depth of 6 fathoms northward of the shore bank at the northeast point of Baagö.

Shoal.—A detached shoal, nearly ½ mile in extent, with a least depth of 3 fathoms, lies 1.4 miles westward of the west point of Ægholm.

Buoy.—A conical black buoy is moored westward of the shoal.

Submarine telegraph cable.—The cable crossing from the northeast point of Baagö has been already noticed.

Remmen, a sandy shoal, nearly 1⅝ miles in length, in a north and south direction, and about 800 yards in greatest width, lies nearly parallel to the east coast of Baagö, separated from it by a small channel with depths of from 6 to 7 fathoms.

The depths on Remmen are from 1½ to 2½ fathoms, the least water being near its south end, and it breaks down abruptly from 3¼ to 8 fathoms on its east side.

A patch, with a depth of 2½ fathoms, lies about 600 yards northward of Remmen and off Baagö Shore Bank.

Directions.—The navigation of Baagö Sound should not be attempted except in clear weather, when the objects used as marks can be distinguished from a distance of at least 4 miles. The leading mark for entering the sound from the northwest is Vejstrup Church in line with the northeast point of Brandsö, bearing 290°, used as a stern mark, until Mariendal house bears 147°. This mark leads in a depth of over 5 fathoms, but close to an extension of shoal ground from the northeast side of Remmen, with 3¼ fathoms over it.

When Husby Church is in line with the westernmost house at Sönder Aaby, bearing 2°, the course should be altered to 182°, and this used as a stern mark, which will lead eastward of the southern portion of Remmen, and with Sandager Church in line with Aborre Minde Beacon 43°, steer 223° with it as a stern mark, which will lead through the deep channel, with Asnæs Reef and Thorö Reef on the southeast and Baagö Flat and Aarö Flat on the northwest side and close to the 2¾-fathom patch northwest of Thorö Reef, so that when Kjærum and Assens Churches are in line, about 119°, Sandager Church should be opened slightly to the northward of the beacon until the east point of Brandsö is well open of the west point of Baagö about 326°.

The west edge of Wedellsborg Wood in line with Baagö Lighthouse 358°, used as a stern mark, leads westward of the shoal ground westward of Thorö Reef.

A deep-draft vessel should enter Baagö Sound from the northwestward, with Tvinsbjerg front leading light structure (white

dwelling) in line with Aborre Mill, bearing 125°, or if these marks cannot be distinguished, steer for Aborre Minde Beacon, bearing about 127°.

Steering on either of these marks, the course should be continued to the southeastward, past the line of Assens leading light structures in one, edging to the southward when the rear light is well open eastward of the front, about 162°, and steering for the tall chimney of Assens sugar factory, 165°, edging round to the southwestward gradually, to bring the dwellings exhibiting Tvinsbjerg leading lights in line 41°, until Baagö Lighthouse bears about 335°, when Sandager Church may be brought in line with Aborre Minde Beacon.

This mark may be continued until Aarö Mill bears 293°, or the west edge of Wedellsborg Wood is in line with Baagö Lighthouse, when course may be shaped to the southward, giving Lille Ground a good berth.

When using the dwellings from which Tvinsbjerg Lights are shown as a mark, great care is necessary to fix the vessel's position frequently, especially when passing Baagö Flat and the 2¾-fathom patch northwest of Thorö Reef, if possible using a range finder to obtain the distance of Baagö Lighthouse, but should the dwellings not be clearly made out, Sandager Church in line with Aborre Minde Beacon must be used as a mark, taking care to open the church twice its breadth of the beacon, when passing the 2¾-fathom patch.

From the southward these directions will be reversed, observing that the vessel should be brought on the leading mark of Tvinsbjerg Light buildings, or Sandager Church and Aborre Minde Beacon, when about 1½ miles southward of Aarö, near Aarö Sound Buoy.

For directions southward of Aarö Sound, see below.

By night.—The sector of fixed white light shown from Tvinsbjerg Front Light structure, between the bearings of 120° and 124°, leads through the channel between Wedellsborg Head and Baagö, and when Assens leading lights are in line, 161°, course should be altered for them, and continued until Tvinsbjerg leading lights are in line, 42°.

The fixed white sector from Tvinsbjerg Front Light being visible for 2° on each side of the leading line, the northern limit leads close along the edges of Baagö and Aarö Flats, while the south limit leads close northwest of the 2¾-fathom patch northwest of Thorö Reef.

Anchorages.—Small vessels can anchor on Remmen as well as on the shore bank of Baagö, there being temporary anchorage on Baagö Flat, and in the bight formed eastward of Sandhammern, where there are depths of from 2 to 2¾ fathoms at 400 yards from the island.

There is also anchorage on both sides of Ægholm, that on the south side being entered by keeping Husby Church in line with the southeast point of Ægholm, bearing 44°.

Fyr Channel is a narrow and somewhat crooked channel between the southwest side of Baagö and the shore bank extending northeast of Aarö and Aarö Flat; on the former are Bastholm, Smaaholme, and Græsholm, small islands.

Depths.—The depths in the channel are from 4 to 6 fathoms, but with the former depth the channel is very narrow, being only about 100 yards in width abreast of Sandhammern.

Bastholm, a small island, lies on the shore bank northeast of Aarö, and 1¼ miles west-southwest of Baagö Lighthouse, and Smaaholme are two islets on a sandbank southward of Bastholm; Græsholm, nearly awash at high water, is situated about ¾ mile eastward of these three islands.

Beacons.—A red beacon, 26 feet high, and surmounted by a red ball, stands on the bank northeast of Bastholm.

A similar beacon, but 19 feet high, is situated on the northwest edge of Græsholm; these beacons are for use in pointing out a fishing boundary line.

Shore bank.—The shore bank surrounding these islands is moderately steep-to on the north side from the depth of 2 fathoms, but less so from the east side of Græsholm; Bastholm Hook, a spit with depths under 3 fathoms, extends for about 1 mile northward of Bastholm.

Buoy.—A white spar buoy, surmounted by two triangles, bases together, is moored in a depth of 4 fathoms east-southeast of Græsholm, on the east end of Aarö Flat.

Directions.—Local knowledge is necessary to navigate this channel without a pilot. Coming from the northward, Ösby Church in line with Tamdrup Hügel, bearing 220°, leads northwestward of the shore bank extending in that direction, from Ægholm, in from 3 to 4 fathoms, and Assens Church in line with Baagö Lighthouse, 115°, leads northeast of Bastholm Hook.

Steering on this latter mark, when Husby Church is drawing toward Baagö town, about 34°, bring the east point of Brandsö astern, bearing about 331°, and steer 151°, until Kjærum Church is midway between Assens Church and the tall chimney of the sugar factory, bearing 113°, when alter course for it, and continue until the southwest points of Brandsö and Baagö are in line, 315°; when using this as a stern mark steer 135°.

When steering for Kjærum Church, as above, Assens Church will be seen on the west side of a red railway station with a sloping roof.

Edge to the southward as Baagö Church comes in line with the southernmost house with a red roof on Baagö, about 348°, and steering 168° on this mark will lead through the southern part of Fyr Channel in a depth of 4 fathoms, until Sandager Church is in line with Aborre Minde Beacon.

Small vessels of less than 12 feet draft may stand over Bastholm Hook and Baagö Flat, with Kjærum Church midway between Assens Church and the sugar factory chimney, and to the northeastward with Barlöse Church in line with Aborre Minde Beacon, 62°, in a depth of 2½ fathoms; to the southwest they may stand over Aarö Flat in a similar depth, with Husby Church in line with the southeast point of Baagö, 17°.

Schleswig coast—Hejls Minde to Örby Hook.—From Gravenshöft the south point of Hejls Minde the coast trends in a southeast direction for 1½ miles to Anslet Hook and then south for ¾ mile to Knudshöft; it is moderately low as far as Gravenshöft, but then becomes steep and wooded, being low after Anslet Hook, but high inland.

Knudshöft is a very conspicuous point, 49 feet high, and wooded, and from it the coast turns to the southwestward.

Anslet Ground.—From Gravenshoft the shore bank, rocky, with weeds on its inner part, extends about ⅓ mile, but at Anslet Hook a tongue named Anslet Ground extends nearly 1 mile, with depths under 2 fathoms; this ground is steep-to on its northeast side.

Buoy.—The east side of Anslet Ground is marked by a conical white buoy, surmounted by two triangles, pointing from each other; it is in 6 fathoms water and has "Anslethage O" on it.

Knudshöft Ground.—The shore bank, rocky on its inner part, extends ⅓ mile eastward of Knudshöft, and 1 mile eastward of it is Knudshöft Ground, a small detached shoal, with a depth of 3 fathoms, separated from Anslet Ground by a channel 600 yards in breadth, with a depth of 4¼ fathoms; the bottom is composed of stones and gravel, but it is surrounded by soft bottom.

Aune Bay, 1 mile southwest of Knudshöft, is shallow, and extends in a southwest direction; its south side is Jörget Hook, a low point, and from Aune Bay the coast trends in a south-southeast direction for nearly 2 miles to Örby Hook.

Rump Ground.—The shore bank between Aune Bay and Örby Hook is generally about ⅔ mile off, but at its southern part Rump Ground extends in a north-northeast direction for 1⅓ miles from Örby Hook and has depths under 2 fathoms ¾ mile from the coast.

Örby Ground stretches 1 mile east-southeast from Örby Hook, with depths under 2 fathoms.

Pilots live on Örby Hook, and will board vessels on the usual signal being made.

The rates of pilotage at the pilot stations on Orby Hook and Aarö are as follows for every meter of draft:

	Apr. 1 to Sept. 30, inclusive.	Oct. 1 to Mar. 31, inclusive.
	Marks.	*Marks.*
Sea to the roads off Hadersleben Fiord or to Stevelt	1.92	2.44
Roads to Stevelt	1.31	4.74
Stevelt to Hadersleben	3.32	4.36
Anchorage or Stevelt to sea, clear of Aarö Flat or north to west of Baagö	1.92	2.44
To Hejls Minde	2.62	3.49
To Aarö Sound	4.01	5.28
To Kolding	5.23	6.93
To Frederibia	6.74	8.72
To Gjenner Fiord	4.01	5.23
To Apenrade	5.23	6.98
To Sonderborg or Faaborg	6.54	8.72

When calculating the rate from a vessel's draft, fractions of a decimeter are reckoned as a whole decimeter.

Hadersleben Förde, entered southward of Örby Hook, extends with many windings for a distance of about 7 miles to Hadersleben, the förde between the shores on either side having a general width of about 400 yards.

Depths.—The depth in the channel at mean sea level is 16 feet, which depth it is endeavored to maintain by dredging, but sometimes less water may be found. A turning place for large vessels, with a greatest depth of 400 feet, has also a depth of 16 feet.

Knude, on the south side of the entrance, and separated from the coast by a channel having depths of from 2½ to 4¾ fathoms, consists of two shoals, with depths of 1¾ fathoms, which extends fully ½ mile from the coast.

Buoyage.—The entrance is marked by a red beacon buoy, with "Hadersleben" lettered on it, and surmounted by the letter H, also by a spar buoy, surmounted by a ball, and a black conical buoy.

The north side of the channel is marked by red spar buoys, each surmounted by a ball; the south side by black conical buoys, and perches and dolphins are placed between them where required.

Pilots may be obtained. The rate of pilotage from sea to Hadersleben for every meter of draft is 1.92 marks from April 1 to September 30 and 2.44 marks from October 1 to March 31.

Ice.—Average ice conditions, see Appendix.

Town.—The town of Hadersleben, the northernmost in Schleswig. has about 10,000 inhabitants.

Communication.—There are daily steamers to Aarö Sound and Assens and a weekly service to Sonderborg; a branch railway connects the town with Woyens on the line between Vamdrup and Hamburg, and there is telegraphic communication.

Coal and supplies.—About 500 tons of coal are kept in stock and supplies of fresh provisions can be obtained.

Repairs.—Small repairs to machinery can be executed by the engine works.

Hospital.—There is a hospital in the town.

Coast—Örby Hook to Halkerhöft.—From Stagodde, the south entrance point to Hadersleben, the coast, which is somewhat low, trends in a southeast direction for 2¼ miles to Aarö Sound Harbor and then turns to the southward for 1½ miles to Raaderhöft, a steep, bare point 41 feet high.

Between Raaderhöft and Halkerhöft, a distance of 2½ miles, in a south-southwest direction, is a bight, and about mid-distance is the outlet of Bankel Damon, a shallow lake; this coast is also low, with the exception of Halkerhöft, from 62 to 72 feet high, steep, and overgrown with bushes.

Of the conspicuous objects on this coast, Tamdrup Hügel is conical-shaped, without trees, and situated westward of Tamdrup Country House; Ösby Church, a white building with a gray roof, its square white tower having a steep roof; Haistrup Mill; Aarö and Aarö Sound lighthouses, and Halk Church, 2 miles west-northwest of Halkerhöft, with a sloping roof and a low tower.

On Tamdrup Hügel, 160 feet high, about 2 miles westward of Aarö Sound Harbor, is a tall signal mast.

Dangers.—Knude Ground, extending from between Stagoddle and Aarö Sound Harbor, has been mentioned, and southward of the latter, as far as Syvsig Hook, a distance of about ¾ mile, the shore bank on the west side of Aarö Sound is very narrow and steep-to, breaking down from 3 feet to 6 and 12 fathoms.

Raader Ground, a rocky reef, extends ½ mile southeast of Raaderhöft, within a depth of 3 fathoms, and on its south side is Spejls Ground, with a least depth of 1¾ fathoms, and several rocks.

Buoys.—The east sides of Knude Ground (I.), Syvsig Hook (K. and L.), and Raader Ground (M.), are marked by red buoys, each surmounted by a ball, and with the letters given against the several dangers.

Aarö Sound Harbor, formed by two stone breakwaters, extending in a northeast direction, is only suitable for small vessels and boats, the depth in the harbor being 1¾ fathoms; vessels drawing less than 6 feet can lie alongside the southern breakwater.

The entrance has a west-northwest direction, and when the south breakwater head is passed the channel bends to the southwest into the harbor, but with a northerly current care is necessary in entering.

Light.—A cylindrical white iron tower, 34 feet in height, situated on the south breakwater head, exhibits, at an elevation of 30 feet above high water, an unwatched group occulting light, with white, red, and green sectors; the white light is visible 11 miles, the red

light 8 miles, and the green light 7 miles, but the light is unwatched. (For bearings of sectors and period, see Light List.)

Leading lights.—Near Haistrup Mill, about 1 mile west-southwest of Aarö Sound Harbor, a fixed white light is exhibited, at an elevation of 119 feet above high water, from a white beacon 49 feet in height, and surmounted by a white square top mark with black border 1½ feet broad; it is visible 8 miles.

From a white beacon, 33 feet in height, and surmounted by a red triangular top mark, situated about ¼ mile westward of Aarö Sound Harbor, a fixed red light is shown at an elevation of 38 feet above high water, and is visible 5 miles.

These lights are 1,550 yards apart, in line bearing 227°, and are visible over an arc of 45° on each side of the leading line.

Storm signals are shown at Aarö Sound Harbor. (See Chapter I.)

Linderum, a small uninhabited island belonging to Germany, and lying 1⅓ miles eastward of Örby Hook, is surrounded by a flat, which is steep-to on its east and south sides; it extends about ½ mile from it except on its southwest side, and on its northern edge is a patch with a depth of less than 1 fathom.

Beacon.—A beacon, black and white in horizontal stripes, stands on the north side of the island.

Buoys.—The west side of the flat is marked by a white can buoy, surmounted by two triangles, pointing toward each other, and with "West Linderum" on the side.

The northeast side is marked by a red spar buoy, surmounted by a ball, and the southeast side has three similar buoys.

Aarö, about 1½ miles in length in a north and south direction and 1¼ miles in width, is low, attaining a height of 23 feet in places, and has no trees, but only a few bushes; its north side is steep for a short distance and its west side is well built over. The island belongs to Germany.

Aarö Kalv extends from the southern part of the east side for a distance of nearly 1 mile in a northeast direction and is separated from the island by a small bay, in which are rocks.

Korsö, a peninsula 1,800 yards in length, extends from the southwest side of the island, separated by a narrow inlet, and a bridge crosses its northern end. On the northwest point of Korsö is Oit Haus, a small house.

Light.—On the northwest side of Aarö a fixed green light is exhibited, at an elevation of 11 feet above high water, from a white pile beacon, and visible 4 miles.

A cylindrical white iron tower, 42 feet in height, situated on the west side of Korsö, exhibits, at an elevation of 40 feet above high

water, an unwatched fixed light, having white, red, and green sectors, the lights visible, respectively, 12, 9, and 8 miles between certain bearings, for which see Light List. The red light is reported to be only seen from 6 miles.

Leading lights.—About midway of the north side of the island are two beacons, the rear, 49 feet in height, having a white rectangular top mark, and the front one, white and 33 feet, surmounted by a red triangle. They are 450 yards apart and in line bearing 170°.

The rear beacon exhibits, at an elevation of 47 feet above high water, a fixed white light, visible 8 miles.

The front beacon exhibits, at 27 feet above high water, a fixed red light, visible 5 miles.

Shore bank.—The shore bank, extending northeast of Aarö, with the small islands lying on it, has been described. On the west side of the island, except where it fills Aarö Bay, northward of Korsö, the shore bank is quite narrow and breaks down steeply to Aarö Sound.

Roter Ground, about ½ mile in length in a north and south direction, with depths of from 2½ to 2¾ fathoms, lies on a bank with less than 5 fathoms, about ¾ mile in length, and separated from the 5-fathom contour line of Barden Ground by a channel nearly 400 yards in width, with from 5½ to 6 fathoms water.

Barden Ground, with 1¼ fathoms, and about ⅛ mile in extent, lies on the northern part of a tongue of shoal which stretches for 1¾ miles northward of the northeast side of Aarö. A channel with a depth of 2¾ fathoms separates Barden Ground from the inner part of this shoal tongue.

Shoal.—A small shoal, with a depth of 2¾ fathoms, lies in Aarö Sound, about 700 yards from the northwest point of Aarö.

Buoys.—A red spar buoy, surmounted by a triangle, apex pointing upward, over a ball, is moored about ⅛ mile northward of Roter Ground.

On the east and southeast sides of Roter Ground are two similar buoys, each surmounted by a ball.

Conical black buoys mark the north edge of the 5-fathom contour line surrounding Barden Ground, the west side of that shoal, and the west side of the inner part of the shoal tongue extending north of Aarö.

The northwest side of the 2¾-fathom patch is marked by a conical black buoy, in a depth of 5¼ fathoms.

Aarö Sound.—The channel between Aarö and the Schleswig coast is divided on its northern side by Linderum, and the passage eastward of that island can be used by large vessels, but that on the west side is only suitable for those drawing about 11 feet.

The channel for large vessels is narrow, especially where obstructed by the 2¾-fathom patch previously mentioned, so that great care is necessary in navigating it, as the current, sometimes running with considerable velocity between Aarö and Linderum, does not always follow the direction of the channel.

Depths.—The depths in the northern approach, between Roter Ground and Barden Ground, are from 5½ to 6 fathoms, and between Barden Ground and the shore bank of Linderum the depths are from 6 to 8 fathoms, but southeastward of Linderum Ground is one patch of 29½ feet, besides several of 31 feet, so that this channel can not be considered as navigable for vessels of more than 27 feet draft.

From the northwest point of Aarö to the southern entrance, the channel has depths of from 7 to 10 fathoms, and is clear of danger outside the shore banks on either side.

Buoyage.—A "Bakentonne" or fairway buoy, red, surmounted by a ball, and marked "Aarö Sound," lies on the leading mark between Brandsö and Roter Ground, and about 1⅓ miles southward of Brandsö.

The eastern side of the sound is marked by conical black buoys, and on the west side by red spar buoys; some of these buoys have been already mentioned as marking the shoals bordering the channel. All these buoys, with the exception of that marking the southeast end of Linderum Ground, are in 5½ fathoms water.

On the east side of the southern entrance is a "Bakentonne" or fairway buoy, similarly surmounted to that at the northern entrance, but painted black.

Directions.—Coming from the northward, between Brandsö and Anslet Ground, Vejstrup Church, in line with the first brickkiln, northeast of Hejls Minde, bearing 306°, and used as a stern mark, leads through the channel and northeast of Knudshöft Ground to the fairway buoy, or, if approaching between Wedellsborg Head and Bradnsö steer 214° for the fairway buoy.

When the western edge of Brandsö Wood bears 342°, steer 162°, keeping it astern, passing eastward of Roter Ground, observing that a vessel will pass northward of that shoal by keeping the tall chimney of the sugar factory at Assens in line with Baagö Lighthouse 119°, and when Haistrup Mill is in line with Linderum Beacon 210°, steer on this mark, which will lead between Roter Ground and Barden Ground in not less than 5½ fathoms until the beacons from which the leading lights are shown (rear, white rectangle; front, red triangle) are in line bearing 170°, which leads between Barden Ground and Linderum Ground.

When eastward of Linderum Ground the beacons near Haistrup Mill and west of Aarö Sound Harbor (rear, white square top mark;

front, red triangular top mark) should be brought in line 227°, passing southward of Linderum Ground between the red buoys marking its edge and the black buoys, on the southeast side the least depth being 4¾ fathoms, continuing this mark until the west extremes of Brandsö and Linderum are in line bearing 349°, which, as a stern mark, and steering 169°, will lead through the sound.

When nearing the shore bank extending eastward of Syvsig Hook, edge slightly to the eastward to bring the western edge of Brandsö Wood in line with the house on Korsö about 354°, and with it as a stern mark, steering 174° will lead between Aarö Sound and Raader Ground to the south entrance to Aarö Sound.

From the southward these directions should be reversed.

Anchorage.—Large vessels can anchor in a depth of 6 fathoms northeastward of Aarö Sound Harbor, and a little to the westward of the leading mark of the west points of Brandsö and Linderum in line, bearing 349°.

German coast.—From Halkerhöft the coast trends in a west-southwest direction for about 2½ miles, and then recedes about 1½ miles in a northerly direction, forming a bight of that width, for 4½ miles, to Suderballighöft, its southwest point.

At first the coast is high and steep, but about 2 miles from Halkerhöft it becomes flat, swampy meadow land, on the east side of which is Das Noor, a small lake; this flat land gives place, on the northwest side of the bight above mentioned, to a wooded coast with cliffs.

Dangers.—Between Halkerhöft and the point surrounding Das Noor, the shore bank to the 3-fathom contour line extends about ⅓ mile, and southward of the former point is a rocky shoal, with a depth of 1 fathom, about 600 yards from the coast.

Revshalen, with a depth of 1 fathom, projects in a southerly direction from the point at Das Noor, and owing to its light green color may be easily seen.

Sand Bay, westward of Das Noor, in the north corner of the bight, is a bay about 1¼ miles square, its western side being formed by the edge of the shore bank, which extends southward for more than a mile from the north side of the bay, its southern point being 140 yards from the coast, the depths in Sand Bay, except off the north shore, are from 7 to 10 fathoms, but winds between southeast and southwest send in some sea.

Coast.—The woods which commence on the northwest side of Sand Bay extend, under the name of Wilstrup Holz, for nearly 4 miles to the southeast side of Slip See, a lake about 1½ miles in length, with a draining canal communicating with the sea.

On the high northwest coast of Sand Bay, in a break in the wood, is the lodge house of Victoriabad; from the outlet of the draining

canal, the coast trends for 1½ miles in a southerly direction, to Suderballighöft, a wooded point.

Depths offshore.—The depths off this coast are very irregular, and from 3¼ to 3¾ fathoms, at a mile southward of Victoriabad, while farther southwest the 5-fathom contour line is fully that distance offshore.

Outlying banks.—Schönhepder Bank, with a least depth of 4 fathoms, over light blue clay, mixed with sand and gravel, lies 1¾ miles southward of Halkerhöft, and on its south and southwest sides deepens suddenly to over 11 fathoms.

Holst Bank, lying midway between this coast and the north side of Alsen, has a least depth of 3¾ fathoms on a small patch, the bottom of the shoal consisting of clay mixed with sand and gravel.

Raaderhöft just open of Halkerhöft, bearing 13°, leads in a depth of 5 fathoms, over the bank, westward of the shoalest spot, and Haistrup Mill over Halkerhöft, about 349°, leads eastward of Holst Bank.

Directions—West of the outlying banks.—Coming from Aarö Sound, steer 176° until Halkerhöft is abeam, and then alter course to 219°, until Loit Church and the saddle of Laadenhöi, on Barsö, are in line, bearing 236°, and continue on this mark until Ösby Church is in line with Halk Church, 5°, when steer 185°, with these as a stern mark, until the north extreme of Alsen bears 79°, when a course may be shaped for Apenrade or Alsen Fiords.

Gunnery practice.—Holst Bank is sometimes used as a practice ground for vessels of the Germany Navy, and targets, lighted by night, are laid down; as the lights marking them may be extinguished, especially in rough weather, care is necessary when passing this locality.

The vessel firing hoists a red pennant at the foremast by day, and three red lanter nlights by night, also shows the searchlight.

Barsö, fronting the entrance to Gjenner Fiord, has near its northern end two bare hills, the northern of which is named Laadenhöi; the few farms on the island are surrounded by trees, and a mill stands near the center of the island.

At Leggerodde, the southwest point of the island, and at some few places on the southern and western sides, the foreshore is low, and in a small shallow bay, northward of Leggerodde, there is landing, and a ferry communicating with Bröde, on the mainland.

The shore bank on the west and south sides is narrow, but from the southeast side Barsö Ground extends in an east-southeast direction for ⅝ mile, and nearly 1 mile to the 3-fathom and 5-fathom line, respectively.

Lightbuoy.—The southeast edge of Barsö Ground is marked by a lightbuoy with south top mark (two triangles points downward)

painted white, and marked "Barsö Grund S," exhibiting a group occulting white light.

Buoys.—Two gray tagret mooring buoys lie about 400 yards northeast by east and the same distance northwest by north of Leggerodde.

Gjenner Fiord, entered westward of Barsö, between Suderballighöft, on the north, and the land about Bröde, on the south, extends about 2 miles in a west-northwest direction, with a width of from ½ to ⅔ mile, and affords anchorage to large vessels, in a depth of 8¾ fathoms, aver a bottom of clay, completely sheltered from any sea by Barsö.

The head of the fiord is hilly and wooded, and about 1 mile within its head, on the north side, is Bismarck Tower, which, standing on Knivsberg, at an elevation of 319 feet, and having the appearance of a church with a broad spire, is very conspicuous.

Suderballighöft, the north entrance point, is 59 feet high, and wooded, and from it a shoal, the inner part of which is rocky, extends for 800 yards in an easterly direction, within the depth of 3 fathoms.

The shore bank on the north side of the fiord extends from 200 to 300 yards.

Buoy.—A white spar buoy, surmounted by two triangles pointing away from each other and marked "Suderballighöft O." is moored at the northeast extreme of the shoal.

South side.—Knudshöft, about 1¼ miles southward of Barsö, has a steep coast, about 52 feet high, but terminates in a low point; it has a clump of dark trees at the edge of the bluff, beyond which a low grassy spit extends, and is easily recognized.

Starbeck Ground extends for 1 mile from the shore, about ½ mile southward of Knudshöft, within the depth of 3 fathoms; it is steep-to outside the 5-fathom contour line, breaking down abruptly to depths of from 11 to 17 fathoms.

Buoy.—The eastern edge of Starbeck Ground is marked by a white conical buoy surmounted by two triangles, pointing away from each other.

Knuds Ground, from the north side of Knudshöft, extends 1,300 yards in a northeast and 1,600 yards in a northerly direction, thereby narrowing the southern channel of approach to Gjenner Fiord. Westward of Knuds Ground is a vein of deeper water, affording anchorage to small vessels in a depth of 5 fathoms.

Bröde Ground.—The land about Bröde, a rounded point, at the south side of the entrance is about 85 feet high and from it Bröde Ground extends in an east-northeast direction for 700 yards, within the depth of 3 fathoms; a shoal of 4¾ fathoms lies 900 yards offshore and outside the 5-fathom contour line inclosing Bröde Ground.

Vorskovhuk, a point on the south side of the fiord, is wooded; the shore bank surrounding it is barely 200 yards off. A patch of 3 fathoms lies 900 yards east by south of the point and about 400 yards offshore, and about that distance northward of the point is a shoal with a least depth of 3¼ fathoms.

Lausens Ground, a small patch of 2¾ fathoms, is situated 600 yards west by north of the point.

Kalö, an island ⅓ mile in length, in a north and south direction, lies at the southwest side of the head of the fiord and Kalö Ground lies off its northeast point; it has a least depth of 1¾ fathoms, the north point of the shoal being about 400 yards eastward of Kalö Nakke, the northeast point.

Depths.—The depths in the northern approach are from 11 to 12 fathoms, and southward of Barsö they are from 12 to 16 fathoms; in the fiord there is from 9 to 10 fathoms water.

Directions.—Having approached from the northward with Loit Church and Laadenhöi Saddle in line, bearing 236°, when Ösby and Halk Churches are in line, 5°, Vorskovhuk should be just open of Suderballighöft, 247°, and may be steered for on that bearing, the course leading northward of Barsö shore bank, and to the south side of the shoal extending from Suderballighöft, which may be rounded by the lead, and the head of the fiord steered for, with Bismarck Tower in line with Hospiz Elim, 289°.

From the southeastward Barsö Mill forms a good mark and should be steered for, bearing nothing to the northward of 334°, which will lead close eastward of Starbeck Ground buoy, and when Bismarck Tower bears 293° alter course for it and steer up the fiord.

Apenrade Fiord, from between Knudshöft and Starbeck Ground, on the north, and Warnitzhöft, on the south, extends for a distance of 5 miles in a westerly direction, with an average width of ½ mile.

The southern shore is very steep, but the cliffs on the north side are less so, and in the inner part of the fiord the land is high and much wooded.

There are few conspicuous marks within the fiord which would be useful for fixing, as the churches and mills near the shore are mostly hidden by trees, but at the head of the fiord Bellevue Hotel and Mill, the former white, Apenrade Church, of red brick, with a square tower and a small belfry with a slender point, and a mill on the north side of the fiord, are all conspicuous.

Warnitzwiek and Elisenlund Piers, although not very noticeable, may be recognized by each having a restaurant at its inner end. Brunland Castle, a moderate-sized white building with a sloping roof, is situated at the southern end of the town and almost hidden

by trees, but there is a large, cylindrical-shaped paper mill in front of the gate of the causeway leading to Glensburg.

Dangers.—Starbeck Ground, on the northern side of the entrance, has been mentioned, and about 2½ miles southwest of it Skar Reef, partly dry and so steep-to that it can not be approached by the lead, extends about 400 yards from the north coast of the fiord; about 1½ miles farther westward the shore bank extends about the same distance, but otherwise it is about 300 yards from the north shore.

South side.—The shore bank, with rocks on its inner part, extends, within a depth of 3 fathoms, for fully ¼ mile northwest of Warnitzhöft, from the shore westward of Felbekshof and between the salmon factory (Lachs Mill) and Stortum, and it is distant about 800 yards from the head of the fiord.

Fishery stakes.—In Aubek Bight, between it and Apenrade, and on the western side of the southwest part of the fiord are stakes used in connection with the cultivation of edible mussels. As the tops of the stakes are in some instances awash, but in the majority of cases some little distance under water, they constitute a danger to small vessels.

In Aubek Bight and the southwest part of the fiord the area containing the stakes is marked on its seaward side by three blue stakes, each surmounted by a bronze-colored fish-shaped board.

Harbor.—The harbor consists of two small basins, the northern being the old and the southern the new harbor, which latter is 820 feet in length, 250 feet in width, and sheltered by a stone breakwater extending in a northeast direction.

Leading lights.—Two unwatched fixed red electric leading lights are exhibited, at elevations of 30 and 20 feet, from the north side of the north harbor, near the coal store, and from the north harbor mole, respectively, and in line lead to the entrance to that harbor.

The rear light is shown from a white mast, 31 feet in height, surmounted by a diamond, and the front light from a white iron standard, 24 feet in height, surmounted by a triangular top mark. Both lights are visible 2 miles.

Two fixed green lights in line lead from the leading line of the red lights into the south harbor.

Dredged channel—Depths.—The harbor is approached through a dredged channel, 130 feet in breadth, the portion leading to the northern basin having a depth of 16 feet and the branch to the southern basin 13 feet, the depths in these two basins being the same. There is not less than 11 feet water alongside the northern side of the quay in the south basin.

Buoyage.—A red fairway beacon buoy, surmounted by a ball, is situated off the entrance, and the starboard side of the channel is

marked by three red spar buoys, with a down-turned triangle, a quadrangle, and rectangle as top marks, also by three dolphins.

The port side has black conical buoys and a red-and-black horizontally striped dolphin at the junction of the channels.

Anchorage.—The anchorage for a large vessel is in a depth of 11 fathoms, with the church bearing northwest, distant 1¼ miles, from which the depths decrease rapidly to the harbor, but nearly all the upper part of the fiord has good anchorage.

Storm signals are shown. (See Chapter I.)

Pilots may be obtained.

The rates of pilotage are:

Vessels of and under 150 cubic meters burden, entering, 3.0 marks.

Vessels of and under 150 cubic meters burden, leaving, 2.06 marks.

Vessels between 150 and 500 cubic meters, entering, 0.02 mark per cubic meter.

Vessels between 150 and 500 cubic meters, leaving, 0.01 mark per cubic meter.

Vessels over 500 cubic meters burden, 0.01 mark for every cubic meter over that amount.

Directions.—Having passed eastward or westward of Holst Bank, according to the directions already given, and with Halk and Ösby Churches in line bearing 5°, and Tundtofter Nakke, off Alsen, 79°, a 242° course should lead southward of Skär Reef, which is steep-to, and when abreast of it the head of the fiord may be steered for.

Bellevue Hotel, in line with the point at Skär Reef, 257°, leads northward of the shoal extending from Warnitzhoft.

By night.—The fixed white sector of light from Augustenhof Lighthouse, between the bearings 126° and 133°, leads between Holst Bank and Barsö Ground, and a similar sector from the same lighthouse, between 70° and 72°, leads up in mid-channel of Apenrade Fiord.

Town.—Apenrade is a small trading town and sea-bathing place, with a population of 6,600; there is a navigation school in the town.

Communication.—A regular steamer runs between Apenrade and Sonderburg, and there is a railway to Rothenkrug, also telegraphic communication.

Coal and supplies.—About 3,000 tons of coal is kept in stock; provisions may be obtained in small quantities, and water mains, with hydrants, are in both havens.

Repairs.—Small repairs to engines and boilers can be executed by the Bastiansen Engineering Works.

Alsen Fiord.—Alsen Fiord and Alsen Sound separate Alsen Island from Sundewitt, the large peninsula between Apenrade and

Flensburg Fiords; the fiord and sound form a deep, narrow, but much-used channel to Sonderburg.

The west coast of Alsen is irregular, consisting of several small bays, which communicate with inner seas or noors; the shores are moderately high, partly steep, and partly sloping.

The southwest shore of Alsen Fiord, from Warnitzhöft to Schnabek Huk, a distance of nearly 7 miles in a southeast direction, is not deeply indented; it has steep cliffs, and the coast is more covered with trees and bushes than the Alsen side. The beach is narrow and consists of stones or gravel, and off Ballegaard and some other parts are lobster pots, which require to be avoided.

On Sundewitt, in addition to Ballebroe Lighthouse, Ulderup, and Wester Saltrup Churches, about 2 miles inland, on the west side of Alsen Sound are somewhat conspicuous; the latter has a white tower, with a slender gray pyramid, but the former is not so well seen.

Light.—Ballebroe is situated 4 miles southeast of Warnitzhöft, and on the coast eastward of it is a white iron tower 18 feet in height which exhibits, at an elevation of 36 feet above high water, an unwatch fixed light, with white, red, and green sectors, visible 6 miles. (For bearings of sectors see Light List.)

Alsen Shore.—Steg Bay, a triangular-shaped bay, situated about 1 mile within the eastern entrance point to the fiord, has depths of from 5 to 10 fathoms, shoaling gradually toward the shore; in the middle of the entrance is a patch with a depth of 4½ fathoms, and between it and the southern entrance point is one of 3 fathoms.

Dy Creek, connected to the head of Steg Bay by a channel 65 feet in width and with a depth of 2 fathoms, has depths of from 3¼ to 3¾ fathoms in a narrow vein of water running through it, in which small vessels of 11 feet draft find anchorage; the channel is marked by Dalben Beacons, the tops of which are painted red on the starboard and black on the port hand entering.

Buoys.—Two red can buoys are moored on the north side of the outer part of Steg Bay.

Wharf.—A wharf, with a depth of 13 feet alongside, extends from the northern side of the inner part of Dy Creek.

Customs guard ship.—During summer, and in winter unless prevented by ice, a revenue vessel is anchored at the entrance to Steg Bay or proceeds to Dy Creek when unable to lie there; the vessel flies the custom's flag by day and hoists a red light over a white one by night.

Ferry.—Hardeshöj Pier, situated 1½ miles southeast of Steg Bay, has a depth of 10 feet alongside, and from it a ferry crosses to Ballebroe.

Sand Bay, the east extreme of Alsen Fiord, and northward of the entrance to Augustenburger Fiord, extends about 1 mile, with a

breadth of ½ mile, and has a depth of 8 fathoms at the entrance, shoaling gradually inward. A peninsula, nearly ½ mile in width, which forms the south side of the bay, separates it from Stevning Noor, a loading place for vessels of less than 13 feet draft, on the north side of which is a wharf for steamers.

From Stolbrones, which forms the southern side of Stevning Noor, a sandy shoal extends for ¼ mile in a westerly direction, within a depth of 3 fathoms, and is steep-to, breaking down abruptly from 2 to 6 fathoms.

Augustenburg Fiord, entered between the sandy shoal extending from Stolbrones and Arnkiels Huk, a width of ⅓ mile, between the 5-fathom contour lines on each side, is in reality a continuation to the southeastward of Alsen Fiord.

From its entrance the fiord extends for 4 miles in a south-southeast direction, with a greatest width of 1½ miles, and then turns to the eastward for 1½ miles, narrowing to about 300 yards; its inner part is very shallow and is surrounded by flat sandy beaches.

Ulkebüll Church, a long white building with a red roof, a low pointed tower, and a belfry, on the south shore of the fiord, forms a good mark.

Dangers—Depths.—Halbmond (Half Moon), a sandy bank extending from the southwest side, about 1½ miles within the entrance, is too steep to be approached by the lead; its edge is marked by a pole, surmounted by a straw wisp.

From the entrance to about ½ mile southeast of this bank, the depths are from 5¼ to 8 fathoms, but within this, with the exception of a vein of water, with depths of from 3¼ to 4¼ fathoms, extending nearly 1 mile southeast, on the southwest side, the depths are less than 3 fathoms. The bottom of the shallow part of the fiord is generally covered with grass or with seaweed where rocks are present.

Augustenburg, situated on the north side of the fiord, near its head, is approached by a channel with a depth of 2 fathoms, but at the steamer pier there is only 1¼ fathoms, and alongside the harbor quay 1 fathom.

The head of the fiord has a dam and a sluice, and over the former is the railway and road to Sonderburg; eastward of the dam is Kl haff, a shallow noor, not connected with the fiord.

Town.—The town of Augustenburg, with about 600 inhabitants, lies quite at the head of the fiord, and is partly hidden from it by a large park. There is railway communication with Sonderburg and Norburg, and post and telegraph offices in the town.

Alsen Sound, from its entrance between Schnabek Point and Arnkiels Point, has a southerly direction for about 5 miles, to Sonderburg, and is about ½ mile in width until nearing its southern end, where

it contracts, and at its southern entrance it is only about 150 yards between the shores on either side.

Low wooded shores, which are the characteristics of its northern part, gradually become higher toward the south, attaining their greatest height abreast Sonderburg. A monument, or memorial stone, is situated close southward of Arnkiels Öre.

Dangers.—Between Arnkiels Öre and Arnkiels Point, the latter the eastern entrance point to the sound, the shore bank extends for a distance of 300 yards to the depth of 3 fathoms, but the 5-fathom contour line is nearly 800 yards off.

The shore bank is only about 70 yards from the west side of Arnkiels Point, and on the east side of the sound it is from 200 yards to 300 yards offshore, until southward of Rodsteen, from which it closes the land to Sonderburg.

Buoy.—A conical black buoy, numbered 1, marks the northwest edge of the shore bank off Arnkiels Point.

Schnabek Hook, a sandy shoal, with rocks on its inner part, extends within a depth of 3 fathoms, for 750 yards northeast of Schnabek Point, the western entrance point, and from it the shore bank, on that side of the sound is 400 yards off as far south as Kwost Nakke, narrowing to 100 yards and 300 yards farther south, till opposite Sonderburg, where it is close to the shore.

In Mühlen Bight, about 1½ miles northwest of Sonderburg, is a dumping ground for dredgings, and here the shore bank is fully 400 yards off.

Lightbuoy.—The northeast extreme of Schnabek Hook is marked by a red conical buoy, with "Alsensund" in white letters, and exhibiting an occulating white light, with a period of eight seconds.

Middle Ground, lying in mid-channel of the sound, ¼ mile southward of Arnkiels Point, has depths of 4¼ fathoms over a distance of about 200 yards.

Buoy.—The north side of Middle Ground is marked by a conical black and red buoy, surmounted by a cross.

Arnkiels Ground, about 200 yards in length in a north and south direction, lies fully 200 yards off the east side of the sound, 800 yards southward of Arnkiels Point, and has depths of 2½ fathoms over it.

Buoy.—A conical black buoy, numbered 2, is moored on the west side of Arnkiels Ground.

Depths.—Alsen Sound resembles a narrow river having the greatest depths, which are from 6 to 10 fathoms through the center; the bottom over the shore bank is covered with sea grass and, where there are rocks, with seaweed.

Buoyage.—The edges of the shore bank are marked in places by buoys which, on the east side, are conical, black, and numbered from the north.

On the west side they are red can buoys, with staves, surmounted by letters, A being about ¼ mile south by west of Arnkiels Point.

Anchorage.—Large vessels can not anchor in the sound without interfering with the traffic, and the best position is in that part northward of Sonderburg, where the direction of the sound is west by north and the opposite, in a depth of 8 fathoms, the holding ground being good.

Anchorage near the bridge crossing the sound should be avoided, as in that locality are remains of sunken vessels.

Sonderburg Harbor is bounded on the north by the pontoon bridge, 778 feet in length, which crosses from Sonderburg to the castle on the opposite shore, and the depths in the middle are from 6½ to 11 fathoms, affording anchorage for large vessels, but they require to also secure to piles on the mainland side.

There are small wharves at which vessels of 13 feet draft can lie, and northward of the bridge, on the mainland shore, are loading and unloading piers, but these are solely intended for the use of the railway; a similar pier, southward of the bridge, is also private property.

Mooring and warping buoys.—There are three mooring buoys in the harbor and two warping buoys for the pontoon bridge; on the edge of the shore bank, on the mainland shore northward of the railway station, are several warping buoys.

Bridge signals.—As the bridge is usually closed, and always so for 10 minutes before a train is due, and is only opened on request, when no obstruction exists, vessels requiring it to be opened must make use of the following signals:

By day.—Steam vessels must give one long blast, followed by three short blasts on the siren, and vessels having no siren should hoist their national colors in the rigging or other conspicuous place.

By night.—Steam vessels, in addition to the day signal, show a white light at the bow, and vessels without sirens also show the same light, and use the fog signal apparatus or bell.

The following are answering signals:

Passage clear.—By day: A red flag shown on the swung-out arm of the bridge; or if both arms are swung out, a red flag on each.

By night.—Green lights shown on the western and red lights on the eastern side of the opening.

Bridge can not be opened.—A green flag by day and two vertical green lights by night.

Vessels pass the bridge in order of approach, but those coming with the stream take precedence of those going against it.

Current signals.—The direction of the current is shown from the pontoon bridge as follows:

North-going current.—A red and white ball, shown on the eastern side, close to the passage.

South-going current.—The ball is not hoisted.

Pilots can be obtained.

Directions.—The passage of the sound is attended by some difficulty in large vessels, as not only does the current run strongly in both directions but there is a liability to be set by it toward either side, and there is also a considerable amount of traffic carried on by small vessels; if entering or passing through Sonderburg Harbor it is advisable to engage a pilot.

Having entered Alsen Fiord from the position arrived at from the directions given above and passed through it in mid-channel, Duppel Mill, open slightly eastward of Kwost Nakke, bearing 179°, leads close eastward of the buoy marking Schnabek Hook, and after passing westward of Middle Ground, between the buoy marking it and that on the shore bank abreast, a mid-channel course should be steered through the sound, leaving the black buoys on the port and red buoys on the starboard hand.

The monument near Arnkiels Öre, Saltrup Church, Satrupholz, and, farther south, the monument on Duppel Heights, may be useful to obtain a position.

Town.—Sonderburg, a town with about 7,500 inhabitants, rises in terraces from the east side of the sound, and in the northern part is the church with a tower and belfry; more toward the center of the town is the town hall, which has a small tower on its northern gable.

The town is unimportant commercially, but it is a naval station, and has a gunnery school of the German Navy; the barracks and school are handsome red brick buildings, standing slightly to the northward of the pontoon bridge.

Communication.—There is a regular service of steam vessels to Flensburg, Apenrade, Hadersleben, Kiel, and Korsör, and communication by rail with Flensburg, Apenrade, Hadersleben, and Alsen. Post and telegraph offices are situated in the town.

Coal and supplies.—About 3,000 tons of coal are kept in stock; fresh provisions may be obtained, and water from hydrants southward of the bridge; demands for the latter should be sent to the town clerk at the town hall.

Repairs.—Small repairs to vessels and machinery can be effected, there being machine shops and an iron foundry.

Submarine telegraph cable.—The direction of a cable which crosses the sound, northward of the bridge, is marked on each side by two white posts, surmounted by white squares, with "Telegraph" on them.

Southern entrance, see Chapter X.

Fyen Shore—Thorö to Hornenæs.—Sönderby Cliff, 2 miles southeast of Thorö, is 145 feet high, without wood, and falls steeply

to the sea; the coast then turns to the eastward for a similar distance, and then trends to the southward, forming Aakrog Bight, which has general depths of from 7 to 9 fathoms.

Dreslette Church, about 4 miles eastward of Sönderby Cliff, Flemlöse Church, and Mulleröd Mill, 1¾ miles south of Dreslette Church, with Helnæs Lighthouse on that peninsula, are the most conspicuous marks on this part of the coast.

Helnæs Peninsula.—Avernæs, a small peninsula, about 1 mile in length, is joined to the main island by a short neck of land on the east side of Aakrog Bight and from its southwest side a narrow strip of land nearly 1 mile in length connects Avernæs to Helnæs Peninsula, which is about 3½ miles in length in a northwest by north and opposite direction.

The peninsula, which is not wooded, has several hills on its north and south sides, which at the latter attain a height of 98 feet, but the western portion of the middle is flat and several steep, yellow cliffs occur in places.

The village, with a small church, only visible on certain bearings, is on the eastern side.

Light.—About 400 yards from Leho, the western point of the southern part of the peninsula, is a square white tower 92 feet in height, with a gray lantern which exhibits at an elevation of 98 feet above high water a fixed, flashing, and group flashing light having white, red, and green sectors, visible, respectively, 16, 15, and 13 miles.

(For bearings of sectors and period see Light List.)

Depths offshore.—Southward of Thorö is Thorö Ground, which, with depths under 3 fathoms, extends 1¾ miles west-southwest from the land, but from Sönderby Cliff the shore bank to the same depth is only 400 yards off.

Round Aakrog Bight and along the west side of Helnæs Peninsula the shore bank is 800 yards off in places, as abreast of Avernæs and the isthmus joining it to Helnæs, and off Langensbo Point, the northwest point of Helnæs.

A bank nearly 1 mile in breadth, with depths under 5 fathoms, extends for fully 1 mile in a west-southwest direction from Leho and has a depth of 3¼ fathoms near its western end, and at the southeast side of Helnæs is Helnæs Head Flat extending 1½ miles in a south-southeast direction, with two patches of 2 fathoms on it, one being near its extreme, which breaks down steeply to 8 fathoms on its south side.

Middle Ground, close eastward of Helnæs Head Flat, is about ⅓ mile in extent, with a depth of 2 fathoms, and lies in the entrance to Sönder Fiord of Helnæs Bight.

Kalvor Reef, on the east side of the entrance to Helnæs Bight, extends about 1,200 yards east-northeast from Kalvor Peninsula, and dries at low water.

Helnæs Bight, eastward of Helnæs Peninsula, is divided into two parts, named Northern and Southern Fiords, by a flat about 4 miles in length in an east and west direction, extending from the southeast point of the peninsula to near Falsled village; on this flat are Ilumö, Horsehovedö, and Vigö, three small islands, the first of these, which is the westernmost and largest, being inhabited.

Haarby, Jordlöse, and Haastrup Churches, which lie a short distance inland on the northeast side of Northern Fiord, are the most conspicuous objects.

There are two entrances from Southern to Northern Fiord, the western, with a depth of 2 fathoms, being between Helnæs and Ilumö; the eastern, which has a depth of 1½ fathoms, is between Vigö and Birkhammer Cliff, and is approached by a small channel, between Ilumö and the short bank northward of Hornenæs, with depths of 1¾ fathoms.

The depths in Southern Fiord are from 4 to 7 fathoms and in Northern Fiord from 3¾ to 5¾ fathoms.

Piers.—In Helnæs Bight are the following loading places, with piers: Near Böjden, close eastward of Kalvör Peninsula (200 feet in length, with a depth of 3 feet); near Falsled, in the bay eastward of Vigö; near Brunshuse, northeastward of Avernæs Peninsula (300 feet in length, with a depth of 3 feet), and on the east side of Helnæs, close to the northward of the western entrance to Northern Fiord, the depth at the pier at this place being 3 feet.

Hornenæs Land is the peninsula which stretches about 4½ miles in a west-southwest direction, with a general width of about 1¾ miles from the southwest end of Fyen, and Hornenæs, its southwest extreme, has steep cliffs facing the Little Belt and Lyö Krog, the channel separating the peninsula from Lyö; Horne Church, situated on high ground about the middle of the inner part of the peninsula, has a high pointed spire at one end and two small towers at the other.

Submarine telegraph cable.—A cable crosses the Little Belt from about ½ mile northward of Hornenæs to to about 1 mile southeast of Taksensand, in Alsen; its direction is marked by telegraph beacons on Fyen. (See Chapter I.)

Lyö, the westernmost of the larger islands in the channel southward of Fyen, is flat about its northwest part, but its eastern side is high and hilly; on the south and west coast it is cliffy. The village, with its church, is in the center of the island, the latter being hidden by trees except on certain bearings; a mill westward of the village is conspicuous. The island is inhabited.

Shore Bank.—The shore bank on the west side of the island extends from 400 to 600 yards off to the 3-fathom contour line, and from the middle of that side Lyö West Flat, a spur of shoal water about 800 yards in width, extends for a distance of 1¼ miles in a west-southwest direction within the depth of 5 fathoms and has a stony patch of 2½ fathoms near its extreme.

Buoy.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 5¼ fathoms 550 yards westward of the 2½-fathoms patch of Lyö West Flat.

The dangers extending from the other sides of the island will be described with the channel southward of Fyen.

Outlying danger—Thorö Bank, about ¼ mile in extent within the depth of 3 fathoms and lying on a bank about 1 mile in extent within the 5-fathom contour line, is situated 1 mile southwest by south of Sönderby Klint, the channel between having depths of from 7 to 9 fathoms; the depth on the shoal is 2¾ fathoms, over sand.

Assens Church open westward of Thorö Huse, bearing about 4°, leads westward of Thorö Bank, and Baagö Lighthouse well open of the southwest side of Thorö 332°, is the leading mark to pass between the shore bank of Sönderby Cliff and Thorö Bank.

Nordlige Lille Ground consists of five patches, with depths of from 3½ to 4¾ fathoms, the southwest patch lying 3¼ miles southwest of Thorö.

In the channel farther south, between Helnæs and Hornenæs on the northeast, and Alsen on the southwest side are Lille Ground, Lang Ground, Alsen Stein, and Steenrön.

A vessel will pass westward of Nordlige Lille Ground with the west edge of Wedellsborg wood in line with Baagö Lighthouse, bearing 358°, and east of it with the same edge in line with the west side of Baagö town, 352°, and Dreslette Church in line with a conspicuous fall in Frederiksgave Wood, leads south.

Lille Ground, the northernmost of these dangers, consists of several stony patches, the least water, 2 fathoms, being about 2¾ miles westward of Leho Lighthouse. A patch, with a depth of 3¾ fathoms, lies 1¼ miles north by east of Lille Ground.

Buoy.—A red spar buoy, surmounted by two triangles, pointing away from each other, is moored, in a depth of 4 fathoms, northeast of Lille Ground.

Lang Ground, lying on the same flat and about 1 mile south-southeast of the middle of Lille Ground, has a least depth of 3¼ fathoms.

Alsen Stein (Hesteskoen), about 1¼ miles south by west of Lang Ground, is ½ mile in length in a north and south direction, and 600 yards in greatest width, within the depth of 3 fathoms, and consists

of a rocky ridge, with depths of from 1 foot to 2 feet, but some of the heads on it dry at low water; it is steep on its east and west sides, but a flat extends off the north end.

Alsenstein West, a patch of 4½ fathoms, lies nearly ½ mile from its southwest side.

Buoys.—Alsenstein East Buoy is conical, white, surmounted by two triangles pointing away from each other and marked "Alstenstein O," and marks the northeast side of the shoal.

Alsenstein West Buoy, a white spar, with two triangles pointing towards each other, is moored on the southwest side of the 4½-fathoms patch, and marked "Alsenstein W."

Steen Rön, 1½ miles southeast of Alsen Stein, is a rocky shoal, with a depth of ¼ fathom, surrounded by a large flat, which, with depths under 5 fathoms, extends 1½ miles in a southeast direction, there being depths under 3 fathoms ½ mile southeast, and the same distance south-southwest of the shoal. A bank 1¼ miles in length, with depths under 5 fathoms, lies parallel to, and southwest of the bank on which Steen Rön lies.

The channel between Alsen Stein and Steen Rön has depths of from 14 to 16 fathoms.

Buoys.—Steen Rön is marked by three buoys, named Steen Ron north, south and west, moored in from 3¾ to 6 fathoms water, and distant respectively from the shoal: Northeast, 600 yards; southeast, $1\frac{9}{10}$ miles; southwest $1\frac{3}{10}$ miles.

North buoy, white spar, with two triangles, pointing upwards, and marked "Steenrön N."

South Buoy, conical white, with two triangles, pointing downward and marked "Steenrön S."

West Buoy, conical white, with two triangles, pointing toward each other and marked "Steenrön W."

Ærö—Skioldnæs, the northwest extreme of Ærö, is situated 4 miles southeast by south of the south point of Lyö. The southwest side of Ærö, which borders the Little Belt, is here described, but the remainder of that island is dealt with below.

Light.—About 350 yards from the extreme of Skioldnæs is a cylindrical granite tower, 72 feet in height, which exhibits, at an elevation of 106 feet above high water, a flashing white light, visible 16 miles.

Fog signal.—During thick or foggy weather a fog siren gives a blast of two and a half seconds' duration every minute.

Southwest coast.—From Skioldnæs the southwest coast of Ærö trending almost straight, in a southeast direction, for about 12 miles to Veisnæs Nakke, the south point of the island, is moderately high, with several buildings, and in most parts has steep cliffs. Although

without woods, quickset hedges in many places give the island the appearance of having them.

The most conspicuous objects are Söby Church, not, however, seen from all directions; Söby and Vester Mills; Bregninge Mill and Church, which latter has a tall, slender spire; Tranderup Church, with a low, open tower; and Store Rise Church, the spire of which is high and sharp.

Dunkjær Mill, surrounded by buildings on a hill 182 feet high, southeast of Store Rise Church, and a yellow cliff at Veisnæs Nakke also form marks.

Shore bank.—The shore bank along this coast is seldom over ⅓ mile off to the 3-fathom contour line, but about 1½ miles southwest of Söby Church a patch of 3¾ fathoms is situated nearly 1,200 offshore, and close to the 5-fathom contour line; patches of 2 and 2½ fathoms lie inside it.

Vodrups Flat, a patch of 4¾ fathoms, on a bank about 1½ miles in extent, with depths under 10 fathoms, lies 2½ miles southwest by south of a position about midway between Bregninge and Tranderup Churches; the bottom of the patch is sand and stones.

Marstal or Veisnæs bugt. (See Chapter XI.)

Alsen—Augustenhof to Pöhls Point.—The northeast coast of Alsen is somewhat high, with in most parts, steep cliffs, and in addition to Norder Holz, an extensive wood, which stretches about 4½ miles along the coast, there are other smaller ones, which obscure many landmarks in the interior of the island, so that few are visible from seaward.

Of those which are conspicuous may be mentioned Oxbüll Church, about 3 miles southeast of Augustenhof, but its tower only is visible, and that between certain bearings; Hagenberg Church and mill, standing high, about 1½ miles eastward of Oxbüll; the tower of the church is white, with a dark, slender spire.

A white farm, standing in a clearing of the wood near Taksensand, is conspicuous, and farther southeast, and about 3 miles northward of the ferry, is Atzerballig Mill, Lysabbel Church being 2 miles southwest of the same; Hügeberg, 264 feet high, and the highest point of the island, is about 1 mile westward of Atzerballig Mill.

Light.—Augustenhof Light, exhibited at an elevation of 88 feet above high water, from a yellow iron tower 66 feet in height, with a large house near it, is a fixed, occulting, and group flashing light having white, red, and green sectors, showing white, red, and green fixed white occulating, and white group flashing, the latter giving two flashes; it is visible 12 miles. (For bearings of sectors and duration of light and eclipse, see Light List.)

Coast.—From Augustenhof the coast trends in an easterly direction, and forms Tundtrofter Nakke, a rounded projection 17 feet high.

Trane Sand.—From Augustenhof the shore bank commences to increase its distance about 400 yards from the shore, and northward of Tundtofter Nakke it is nearly 1,200 yards, at which distance the depths are from 1½ to 1¾ fathoms, close to the 5-fathom contour line, which then breaks down steeply to 10 and 13 fathoms.

Buoy.—The north edge of Trane Sand is marked by a conical white buoy, surmounted by two triangles, pointing upward, and having "Tranesand N." on it.

Tranerort.—The coast from Tundtofter Nakke trends southeastward for 4 miles to Tranerort, and is nearly all cliffy; the shore bank, within a depth of 3 fathoms, is about 600 yards off.

Light.—On Tranerort is a white cylindrical iron tower, 31 feet in height, which exhibits, at an elevation of 39 feet above high water, an unwatched fixed light, having white, red, and green sectors, visible, respectively, 12, 9, and 8 miles. (For bearings of sectors, see Light List.)

Tranerort Ground, with depths under 3 fathoms, extends for about ⅝ mile north by east of Tranerort, and is continued to the northward for a farther distance of about 800 yards by a bank about ½ mile in breadth, with depths under 5 fathoms; a patch ¼ fathom lies on Tranerort Ground ⅓ mile eastward of Tranerort.

Buoy.—A white spar buoy, surmounted by two triangles pointing away from each other, and marked "Tranerort O," is moored on the edge of the 5-fathom contour line northward of Tranerort Ground.

Taksensand.—From Tranerort the coast trends southeastward, forming a bight which recedes about ½ mile, and about 1 mile from Tranerot is the commencement of Norder Holz Wood.

Light.—On the rocks extending from Taksensand is a cylindrical brick tower, 104 feet in height, which exhibits, at an elevation of 92 feet above high water, a group flashing, fixed, and occulting white light, visible 15 miles. (For bearing of sectors, and duration of light and eclipse, see Light list.)

Shore bank.—Abreast the commencement of Norder Holz Wood, the shore bank, to the 3-fathom contour line, extends in a broad tongue for a distance of 1,200 yards, and then closes the shore to 400 yards, but off an embankment along the coast it increases its distance to 600 yards and is named Bostedhöft.

Taksensand, northward of the point, extends ½ mile off, and breaks down steeply to depths of 16 and 18 fathoms.

The bottom on the shore bank along this coast is composed of white sand, which shows well, particularly on Tranesand and Taksensand;

in some places weeds will be found, and on the whole stretch rocks lie close to the coast.

Buoy.—A conical white buoy, surmounted by two triangles pointing away from each other and marked "Taksensend O," marks the north edge of Taksensand.

Pöhls Point.—From Taksensand the coast turns to the south-southeastward for about 9 miles to Pöhls Point, the shore bank being generally about 600 yards off; the ferry, which connects with the railway to Sonderburg, is about 3 miles northward of Pöhls Point.

Leading lights.—On the east coast of Alsen, about ½ mile northward of Pöhls Point, is a cylindrical white iron tower, 36 feet in height, which exhibits at an elevation of 65 feet above high water an unwatched flashing white light having a red sector and visible 13 miles. (For bearings of sectors, see Light List.)

A fixed white light, situated 224°, distant 600 yards from the high light, is exhibited at an elevation of 29 feet above high water from a white iron mast 19 feet in height and visible 10 miles. This light shows its full power over an arc of 12½° on each side of the leading line.

Pöhls Reef, extending 1½ miles south-southeast of Pöhls Point, to the 5-fathom contour line, has several rocky heads on it with depths of from ½ fathom to 2 fathoms.

Buoy.—A white spar buoy, surmounted by two triangles, pointing downward, and having "Pöhls riff S." on it, is moored on the southeast edge of Pöhls Reef.

Directions.—Continuing on the leading mark out of Baagö Sound until near Aarö Sound south fairway buoy, or having passed through Aarö Sound, from that buoy steer about 214° for Helnæs Lighthouse, until Augustenhof Lighthouse bears 235°, when alter course to 149°.

With Horne Church in line with the south side of Hornenæs, 58°, steer 152° for 9¼ miles, or until Lysabbel Church bears 259°, distant 4½ miles.

Large vessels, steering for Helnæs Lighthouse, should not go to the eastward of the line of Hornenæs in one with the west point of Helnæs, 135°, and a vessel will be northward of Lille Ground, with Horne Church in line with the south side of Helnæs, 99°.

A point on the south side of Hummel Bay, just open of Mummark Point, bearing 162°, leads eastward of Steen Rön, and Oles Kobbel, a wood near the beach, southward of Fünenshaff, open of Mummark Point, from which it is distant about 3½ miles, 329°, leads along the east side of Pöhls Reef.

West Channel.—This is the best channel for deep-draft vessels. A vessel from the northward, passing between Lille Ground and the

dangers southward of it, on the east, and the coast of Alsen on the west, should steer for Tranerort Lighthouse, bearing 159°, and when Taksensand Lighthouse bears 136° alter course for it until Tranerort Lighthouse bears about 290°, when bring it astern and steer 110°, and when Taksensand Lighthouse bears 234° shape a course to pass Pöhls Point at any convenient distance.

By night.—If passing eastward of Lille Ground and the other outlying dangers in the channel the fixed white sector from Helnæs Lighthouse, bearing eastward of 125°, leads to the west point of that island, and the fixed white sector from the same lighthouse, between 329° and 342°, leads down the channel.

To pass between Alsen Stein and Steen Rön, on the northeast, and the coast of Alsen on the southwest side, keep in the sector of fixed white light from Taksensand, between 134° and 142°, until in the fixed white sector from Tranerort, between 280° and 290°, and steer 105°, with the light astern, and when in the fixed white sector from Helnæs, alter to about 157° down the channel.

In thick weather a large vessel should not go into a less depth than 10 fathoms on either side of the Little Belt, when between Fünenshaff and Pöhls Point.

Anchorages.—In fine weather large vessels may anchor on Vodrups Flat, and with westerly winds there is good anchorage in depths of from 5 to 6 fathoms in Hummel Bay, on the east coast of Alsen, about ¾ mile offshore.

Channel south of Fyen.—The channel southward of Fyen is bounded on the west by an imaginary line, joining Hornenæs and Skioldnæs, and on the east by a similar line between the southeast end of Turö and Næs Head; for the purpose of its buoyage system it is considered as two fiords, separated from each other at Svendborg and Marstal.

Hornenæs to Faaborg Fiord.—The coast between Hornenæs and Knolden, a distance of 5 miles in an east-southeast direction, forming a bight, which is the north side of Lyö Krog, the channel between Horne Land and Lyö, is high, with steep bluffs toward the channel; Horne Land is well built over, and on its south side are several small woods.

Horne Church has already been mentioned as a conspicuous object, and ⅔ mile southwest of it is Tostebjtrg, 209 feet, and the highest point; Knolden, the southeast extreme of Horne Land, is 75 feet high, joined to the coast by Drejet, a narrow strip of land, and has steep, light-colored cliffs on its south side. Dyreborg fishing village is situated northward of Knolden.

Shore bank.—The shore bank along the south side of Horne Land is narrow, and moderately steep-to; from the south side of Knolden a narrow prong of shoal, with depths under 3 fathoms,

extends 1¼ miles in a south by south direction, and near its end Knaste Ground.

Knaste Ground, a rocky bank, which nearly dries in some places at low water, is about 1,600 yards southward of the east point of Knolden, with depths of from 2 to 2½ fathoms, on the shoal connecting it.

Buoys—Light.—Knaste Ground is marked by three buoys:

On the northwest by a red spar buoy, surmounted by an upturned broom. A fixed white lantern light is shown occasionally from this buoy when vessels are expected.

On the southwest side by a white spar buoy, surmounted by a straw wisp.

On the south, a similar buoy, with two straw wisps.

Bregninge mill open southward of Svelmo house, bearing 94°, leads southward of Knaste Ground.

Knoldsand, the south side of which is named Knoldhjörne, extends 800 to 1,000 yards east and northeast from Knolden, and is steep-to; between Knoldhjörne and Knaste Ground, and close to Knolden there is a deep bay, formed by the shoals, and with from 8 to 9 fathoms.

Light.—A fixed white lantern light is shown from a post on Knoldsand when vessels are expected.

Buoys.—Three white spar buoys, surmounted by straw wisps, mark the east side of Knoldsand and Knoldhjörne.

Lille Ground, a rocky shoal, with a least depth of 1 fathom, lies ⅔ mile east by south of Knolden.

Buoys.—Three white spar buoys, surmounted by straw wisps, mark the east side of Lille Ground.

Lyö, the westernmost of the large islands in the channel southward of Fyen, has already been described with the dangers on its western side.

Lyö Trille, a sandy tongue of shoal extending in an easterly direction from the north point of Lyö, is steep-to, breaking down abruptly to 10 fathoms.

The east end of Lyö Trille is marked by a red spar buoy, surmounted by an upturned broom.

Lyö Harbor, the bay on the east side of Lyö, affords anchorages for both large and small vessels, in depths of 10 and 3 fathoms, respectively, but the shore bank extends about 70 yards from its shores.

Pier.—A pier, 820 feet in length, with a depth of 2 fathoms near its head, is situated in the south part of Lyö Harbor, and a road connects it with the town. Easterly winds raise the level of the water 6 feet, and those from westward lower it 5 feet. Provisions and

water can be obtained on the island, which has telephonic communication.

Lyö Sand, stretching about 1,200 yards northeast of the east point of Lyö, is steep-to on its north side; southward of it the shore bank, within a depth of 3 fathoms, extends for about a similar distance around to the southeast side of the island.

The bottom on the shore bank of the island is generally sand, with some large rocks.

The northeast side of Lyö Sand is marked by a red spar buoy, surmounted by an upturned broom, and the east side by a similar buoy, but with two upturned brooms.

Submarine telegraph cable.—A cable crossing from the pier to immediately northward of Knolden, is marked on both sides by two white telegraph posts surmounted by triangles.

Avernakö, the next large island, eastward of Lyö, is 4¼ miles in length in a northwest and opposite direction, and about 1 mile in breadth at the former and ½ mile at the latter part, the center being a narrow low strip of land; Korshavn, the southeast and highest part, is 103 feet high, and is well built over, but has no trees.

Avernakö Church and Betzy Mill, both on the northwest part, are conspicuous; Anker Head is the west point.

Pier.—A boat pier at Avernakö is 361 feet in length, and has a depth of 9 feet at its outer end.

Dangers.—The shore bank is generally narrow, Gala Reef, the name of the greatest breadth, which is ⅓ mile, being off the west point. Avernakö Trille, a small dry sandy spit, extends from the north point; the north side of Korshavn is surrounded by shoal water extending about ¼ mile, and Rev Trille extends eastward of the southeast point.

The bottom on the shore bank is sand and rock, with weed in some places.

For continuation of shoals to the southeastward, see below.

The northeast point of Avernakö Trille is marked by a red spar buoy, surmounted by an up-turned broom, and the east side of Korshavn Reef Trille by a white spar buoy, with a straw wisp.

Skrams Flat, a detached shoal, lying southeastward of Lyö, in the channel between it and Avernakö, consists of two patches, both having a northwest and opposite direction, the northern, ½ mile in length, with a least depth of 3 fathoms, and the southern, 1¼ miles in length, with 2¼ fathoms; the bottom is sand, with some clay and rocks.

Buoy.—A red spar buoy with one upturned broom is moored at the northwest extreme of this shoal.

Anchorages.—The anchorage in Lyö Harbor, in 10 fathoms for large and 3 fathoms for small vessels, is good, the bottom being soft clay.

There is also good anchorage in Dryeborg Bight in depths of from 3½ to 4 fathoms, with good holding ground.

Pilots live at Dyreborg, and take vessels to places in the Little Belt to Assens and through Aarö Sound.

Directions.—Vessels may pass on either side of Lyö, and those from the northward can round Hornenæs, at distances of from ¼ to ½ mile, and pass through Lyö krog, with the south point of Knolden in line with the low north point of Lyö, bearing 96°, and keeping to the northward when nearing the latter point.

When the high northeast point of Korshavn is in line with the low northeast point of Avernakö, about 117°, it leads northward of Lyö Trille and Lyö Sand and close to the southwest side of Knaste Ground, so that when Lyö Sand is passed keep more to the southward until Bregninge Mill is open south of a bush near the house on Store Svelmö, bearing 95°, which leads southward of Knaste Ground and northward of Avernakö Trille, in not less than 4 fathoms water.

From the southward, to pass between Lyö Sand and Skrams Flat, Faaborg Bell Tower should be kept in line with Sidser Odde, bearing 23°, until Aastrup Church is in line with the southeast point of Björnö 59°, which mark leads between Knaste Ground and Avernakö.

Horne Church, open westward of Knolden, bearing 343°, leads between Skrams Flat and Gala Reef, the shore bank westward of Avernakö, in not less than 4 fathoms, and small vessels can pass over the west end of Skrams Flat in a depth of 3 fathoms, with Helene Mill between the two highest hills on Björnö 40°.

Faaborg Fiord, the navigable water northward of Björnö and of Gryderne, the shallow bank extending northeast of that island, is entered on either side of Björnö; the shores of the fiord are low, and at the tile works, ½ mile southeast of Faaborg, are two low bluffs.

On the west side the land rises to Lykkehöj 159 feet, and to Horne Church and northward and eastward of the fiord it is also high and wooded in places.

The most conspicuous objects are Faaborg Bell Tower, the church with a spire, and the mills eastward and westward of the town; the tile works are situated near the coast, about 1 mile southeast of the town.

Nearly 2 miles northward of Faaborg is Svanninge Church, with a tall spire, and 1½ miles northeast is Diernisse Church, the tower of which is pointed. Helene Mill, nearly 1 mile southward of Diernisse Church, is 208 feet high.

Björnö, about 1½ miles in length in a northwest and opposite direction, is hilly, but without woods.

Shore bank.—The shore bank along the southwest side of Björnö is narrow and moderately steep, the 4-fathom contour line being 300 yards offshore. From the east and northeast sides the bank extends in a flat, which almost joins the shore bank from the main island, being separated by Gryde Channel. The bottom on the shore bank is sand and weeds, with rocks in places.

Light.—A fixed white light is shown from a post on Langetang Flat when vessels are expected.

Buoys.—The edge of the southwest shore bank is marked by a red spar buoy, surmounted by an upturned broom, and Langetang Flat, extending from the west side of the island, has a similar buoy on its west side.

Pier.—On the northeast coast of Björnö is a landing pier, 300 feet in length, with a depth of 3 feet.

Submarine telegraph cables.—A cable crosses from the northwest point of Björnö to Dyreborg Wood and another from the southeast point to the north point of Avernakö.

Gryderne, a flat and rocky reef extending in a northeast direction from the east side of Björnö, has depths of from 1 foot to 3 feet on the reef and a small islet at its outer end.

The extreme of Gryderne, which forms the south side of Gryde Channel, is marked by two white spar buoys, surmounted by straw wisps.

Björnö Holme Flat, with depths of from 1 foot to 1 fathom on its outer end, and steep-to on all sides, extends for about 1,200 yards southeast of Björnö. Holmene, a long, low, and narrow dry ridge, is situated on the middle of the flat.

Buoys.—The south side of the extreme of Björnö Holme Flat is marked by a white spar buoy, surmounted by a straw wisp.

The north side of the shore bank from Björnö has a red spar buoy surmounted by an upturned broom.

Potte Ground, lying 200 yards from the southeast point of Björnö, is small and has a depth of 3 feet over sand and weeds, with some rocks.

Western entrance.—Dryeborg Bight is a bight westward of the north point of Björnö, and eastward of it are Alsgaards Head and Sidser Odde, two points on the western side of the western and principal entrance to Faaborg Fiord, and from the points, respectively, Gammel Rön and Sidser Rön, with depths under 2 fathoms and steep-to, extend 400 and 500 yards; Dyreborg Wood is situated northward of Dyreborg Bight.

Light.—A fixed white light is shown from a post on Sidser Rön when vessels are expected.

Buoys.—The extremes of Gammel Rön and Sidser Rön are each marked by two white spar buoys, surrounded by straw wisps.

Höjen, on the western side of the fiord, about 140 yards northeast of Sidser Odde, has a depth of 1¼ fathoms, with about 2 fathoms between it and the shore, and about ⅔ mile farther north, on the same side, is Sletrön, a rocky shoal that dries at low water, and is 800 yards from the harbor entrance.

A detached shoal, with a depth of 3 fathoms, lies ½ mile eastward of Sidser Odde.

Buoys—Light.—White spar buoys, surmounted by straw wisps, mark the north and south sides of Höjen and the east side of Sletrön. The southern of the buoys marking Höjen occasionally shows a fixed white lantern light when vessels are expected.

East side.—On the east side of the fiord is Diernisse Ground, with a depth of 1½ fathoms, lying 1½ miles southward of the harbor, and eastward of it Katterö Reef extends in a southwest direction for 1,200 yards from the coast, forming the northeast side of Gryde Channel; a shoal of 2¾ fathoms lies ⅓ mile north by east of Diernisse Ground.

Buoys.—The east side of Diernisse Ground is marked by a white spar buoy, surmounted by a straw wisp, and the southwest side of Katterö Reef, on the northeast side of Gryde Channel, has two red spar buoys, surmounted by upturned brooms.

Depths.—The depths in the western entrance are from 4 to 6 fathoms, and in the fiord, where the bottom is irregular, from 3½ to 5 fathoms.

Faaborg Harbor is formed by a mole on the southeast side, which extends for about 650 feet in a southwest direction, and a breakwater on the northwest side, which extends southward for 400 feet and turns to the southeast for 250 feet, with an entrance between it and the mole head, 100 feet in width, facing south-southwest.

The depths in the entrance and the greater part of the harbor are nearly 21 feet, but winds from northeast raise the level 2 feet, and those from northwest lower it by the same amount.

Light.—From a post situated on the mole head on the east side of the entrance, a fixed red light is exhibited at an elevation of 16 feet above high water.

Anchorages.—Large vessels can anchor close inside the western entrance in depths of from 4 to 6 fathoms, with Diernisse Church in line with the tileworks, southeast of Faaborg, bearing about 44°.

Small vessels find anchorage from one cable to 300 yards off the south end of the harbor in depths of 3 to 3½ fathoms, with Faaborg Clock Tower and Church in line, and Svanninge Church open of the town.

Pilots may be obtained at Dyreborg, and a small tug is available; there are three warping buoys.

Directions.—A vessel coming from the westward, with Helene Mill between the two highest hills on Björnö, bearing 40°, will have

not less than 6 fathoms water, passing southward of Knaste Ground and Lille Ground, and Horne Church in line with the west end of a high, light-colored cliff, eastward of Dyreborg, about 320°, leads between Lille Ground and Björnö.

When the north part of Knolden bears 279° with Hornenæs shut in, and Svanninge Church is drawing toward Sidser Odde about 359°, steer more to the northward for the western entrance, proceeding through it with Svanninge Church in line with Sidser Odde north until Diernisse Church is in line with the tile works about 44°, but without local knowledge it would be prudent to employ a pilot.

When Horne Church is well open northward of the wood on Sidser Odde about 309°, a vessel proceeding to the harbor may steer to pass eastward or westward of Höjen, according to draft of water, and Faaborg Church in line with the railway buildings leads eastward in 2¾ fathoms. Westward of the shoal the depth will be 2 fathoms.

Small vessels can steer for the entrance, passing northward of Knaste Ground and Lille Ground, in a depth of 2 fathoms, by keeping Helene Mill between the northernmost hills on Björnö and between Knolden and Knaste Ground a vessel may be between the marks of Faaborg Eastern Mill in line with the northwest point of Björnö, and Faaborg Clock Tower in line with Sidser Odde.

Gryde Channel, the eastern entrance, has a depth of 2 fathoms, and must be navigated by the buoys.

Lights.—Two fixed white lights are shown from posts on Katterö Reef on the northeast side of the channel when vessels are expected.

Town.—Faaborg has a regular service of steamers to Copenhagen, Korsör, Svendborg, Sonderborg, and Flensburg, and it is a station on the railway between Odense and Svendborg, with postal and telegraphic communication.

Coal and supplies.—The coal stores are capable of storing from 12,000 to 15,000 tons of coal. Fresh provisions are plentiful and water from the town waterworks is laid on the quays.

Repairs.—Small repairs to machinery might be effected in a machine shop.

Coast.—Hanse Bight, about 1¼ miles in width, is situated on the eastern side of Gryde Channel, its western side being formed by Gryderne and Katterö Reef; the coast is low, with some low green cliffs, the latter especially about Nab, the southeast point.

Shore bank.—The shore bank, on the north side of Hanse Bight, is narrow, but off the Nab it extends in a southwest direction for nearly 1 mile.

Store Svelmö, lying about 1 mile southward of the Nab, on the end of a flat which stretches about 1½ miles southwest from the coast, and forms the west side of the entrance to Nakkebölle Fiord, is an

irregular-shaped island nearly 1 mile in length in a northeast and opposite direction, and has on it two conspicuous houses close to each other.

Lille Svelmö, a small island, is close northeast of Store Svelmö.

Svelmö Trille, a dry spit composed of white sand, extends for ¼ mile from the south point of Store Svelmö, and is steep-to.

Nakkebölle Fiord extends about 1 mile in a northerly direction from between its entrance points, where it is nearly 1 mile in width.

Dangers—West side.—The shore bank, southeast of Store and Lille Svelmö, extends nearly 1 mile, and about the same distance from the coast eastward, Svelmö Laar Ground, the southeast extreme, with a depth of 1¼ fathoms, being the outermost danger on the west side of the entrance to the fiord.

Within Laar Ground, on the same side, is Bremer Hook, composed of sand and weeds, with some large rocks inside the 1-fathom contour line.

Buoys.—A white spar buoy, surmounted by a straw wisp, is moored on the southeast edge of Laar Ground and of Bremer Hook, and the east side of the latter shoal is marked by two similar buoys.

East side.—The shore bank, extending in a southwest direction for about 1 mile from the east side of the fiord, terminates in Rödlok, a shoal of sand, weeds, and some rocks, with depths of from 2 feet to 1 fathom. Lange Laar, northward of it on the same side, is similarly composed, and has from 3 to 5 feet water.

Buoys.—White spar buoys, surmounted by straw wisps, mark the southwest and southeast sides of Rödlok, and Lange Laar has two red spar buoys surmounted by upturned brooms on its western edge.

Fjellebro Harbor, on the northeast side of Nakkebölle Fiord, is formed by a breakwater extending in a southeast direction for about 250 feet, and one about 200 feet in a southwest direction, the entrance, facing south, being about 35 feet in width.

The depth in the entrance is about 10 feet and in the harbor from 7 to 10 feet, but winds between northeast and east raise the level 5 feet and those between southwest and west lower it by the same.

The channel to the harbor is marked by red and white spar buoys, according to the Danish system. (See Chapter I.)

The nearest railway station is at Peirup, on the line to Faaborg, and the post and telegraph offices are at the same place; fresh provisions and water can be obtained. A telephone at the harbor connects with towns in Fyen.

Coast.—The coast from Nakkebölle Fiord, which trends in an easterly direction for about 2½ miles, and then turns southeastward round Lehnskov Point, is low, with small woods in places, while in others it is well built over; westward of Lehnskov Point is a conspicuous green cliff.

Aastrup Church, at the head of Nakkebölle Fiord, has been mentioned, and 1¼ miles eastward of it is Vester Aaby Church, both being conspicuous; other objects are Skjoldemose Mill, which is situated on high ground about 3 miles of Vester Aaby, and Egense Church 2 miles northward of Lehnskov Point.

Lehnskov Point is wooded close down to the shore.

Shore bank.—The shore bank from Nakkebölle Fiord eastward is narrow, within the 3-fathom contour line, being from ⅓ mile off abreast Ringsgaard, 1½ miles southeast of the fiord, to about 200 yards from Lehnskov Point.

Flæskholm, lying on Flæskholm Flat, 1 mile eastward of the east point of Avernakö, is a small islet, from which the flat extends 1 mile northward, being the continuation of the shore bank on the north side of Drejö; on the west side the flat connects with Revtrille, with a channel over it, in which the depth is 2 fathoms. The bottom on the flat is sand, rocks, and weeds.

Buoy.—A red spar buoy, surmounted by an upturned broom, marks the north side of Flæskolm Flat.

Skaarö, a low island without trees, having on it a village and some detached houses, is about 1⅓ miles in length in an east and west direction and a mile in greatest breadth; it lies on a bank 3 miles eastward of Flæskholm, a blind channel with depths of from 3½ to 5 fathoms separating the banks.

On the east side of the island the bank on which it lies is separated from Tassinge by Knude Deep.

Skaarö Reef, a sandy spit with ¼ fathom water, extends for ½ mile in a northeast direction from Skaarö, its north end being steep-to.

A red spar buoy, surmounted by an upturned broom, marks the northeast end of Skaarö Reef.

Pier.—A pier, with a depth of 8 feet alongside it, extends from the north side of Skaarö.

Channel.—From Avernakö Trille a channel, nearly 1 mile in width, leading to the western entrance to Svendborg Sound, has a moderately even bottom, with depths of from 7 to 10 fathoms, increased to 11 fathoms southward of Lehnskov Point; the bottom of the channel is clay and mud.

Anchorages.—Large vessels can anchor all over the channel between Avernakö and Svendborg Fiord, the bottom being soft mud with clay in places. Small vessels may anchor on Gala Reef, on the west side of Avernakö, in depths of from 2 to 3 fathoms, with Svanninge Church in line with Sidser Odde, or on the east side of Avernakö Trille.

There is good anchorage in the bay northward of Korshavn off the village, and vessels can anchor off Revkrog, on the east side, in a depth of 5 fathoms.

Directions.—Having passed northward of Avernakö Trille, with Bregninge Mill open southward of a bush near the houses on Store Svelmö, bearing 95°, steer about 113°, between Store Svelmö and Korshavn, until Bregninge Mill is in line with Lahnskov Point, 90°, which will lead northward of Flæskholm Flat and Swaarö Reef, and when nearing Lehnskov Point edge to the southward to pass it from 400 to 600 yards distant.

A small vessel from the southwestward can pass over Flæskholm Flat by keeping the south side of a shrubbery on Lehnskov Point in line with the south extreme of Flæskholm, bearing 75°, and when Nakkeodde, the north point of Korshavn is in line with the point at Revtrille, 337°, the vessel will be across the flat and in deep water, when Ullebölle Church should be brought in line with the west end of a conspicuous house near the beach, about 31°, which will lead northwest of Flæskholm Flat, in a depth of 2½ fathoms, and the north edge of a spruce plantation, northward of Bregninge Mill, in line with Lehnskov Point, 84°, leads over the north end of Flæskholm Flat, in a depth of 2 fathoms, and northward of Skaarö Reef, in over 4 fathoms.

Submarine telegraph cables.—A cable crosses from the southwest side of Skaarö to the northeast side of Drejö, and its direction is marked on the former island by two white telegraph posts surmounted by triangles.

Another cable, from the east end of Skaarö to Vornæs Skov, on Taasinge, is marked by two telegraph posts, with triangles, situated on Skaarö.

Svendborg Sound.—The eastern part of Svendborg Sound, with the approach to Svendborg from that direction, has been described, and the western part, the channel between Fyen and Taasinge, is entered between Lehnskov Point and Vornæs, 1¼ miles apart.

Fyen Shore.—Between Lehnskov Point and Svendborg the coast is moderately low with, in several places, green cliffs and some small woods; St. Jörgen Church, near the north coast of the Sound and about ¾ mile westward of Svendborg is, with other churches at Svendborg, conspicuous on this side of the Sound.

Taasinge.—Vaarö Knude, the southwest point of Taasinge, is a small, low hill with a steep cliff on its south side, and the west and northwest sides of the island are moderately low, but toward the northern part, where are Bregninge Church and Mill, it is 231 feet high; about the middle of the south part of the island is

Bjerreby Church and Mill. Vornæs, the southern entrance point, is covered by the wood of the same name.

Vornæs Buoy.—A red and white striped spar buoy with one upturned broom and a straw wisp is moored in a depth of 2¾ fathoms off this point.

Knude Deep.—The shore bank along the west coast of Taasinge is generally about ¼ mile in breadth and close to its edge, and between it and the flats on which lie Skaarö Hjortö, and other islands, is Knude Deep, a narrow, crooked channel, which leads around Vaarö Knude to Strynö.

The depths in the channel, which are from 6 to 6½ fathoms at its entrance, decrease to 3 fathoms abreast Skovballe Wood, where it is crossed by a bar on which the depth is 2½ fathoms.

Close northwest of this bar is a rocky shoal with 4 feet water and on the west side of the channel, 1 mile southeast of Skaarö, is a rocky shoal with 5 feet.

Channel—Depths.—From the entrance to Svendborg Sound, between Lehnskov Point and Vornæs, 1 mile apart, the Sound trends in a northeast by east direction for 4½ miles to Svendborg, the shore bank drying in places on both sides of the fiord. On the north side it is generally narrow, but on the south side, when about 1 mile within the entrance, it extends about ½ mile and has an islet on it.

Dödmanden, which crosses the Sound southwestward of St. Jörgen Church, has a depth of 5 feet and constitutes the principal obstruction in this channel, which from the entrance of Dödmanden has depths of from 5 to 9 fathoms, but within that shoal the passage is toward the southern side and the depths are less, the least depth being 14 feet in a channel dredged through Dödmanden.

Light.—A fixed white light is shown from a spar beacon on Dödmanden when vessels are expected.

Buoyage.—The south side of the channel is marked by red spar buoys surmounted by upturned brooms, and the north side by white spar buoys with straw wisps; but at Svendborg the buoyage changes, and the eastern entrance is considered as a separate sound, the harbor being at the head of each.

Pilots can be obtained at Svendborg, and pilot vessels to places in both Belts also.

Piers.—At Rantzausminde, on the north side of the sound, is a pier with a depth of 10 feet alongside, and from Baekkehave, on the south side, another pier extends, which has 5 feet water at it.

Hjortö, situated 2½ miles northwestward of Vaarö Knude, is about 1 mile in length in an east and west direction and ½ mile in width. It has two houses on its northwest end and a mill near its southwest coast.

The flat which surrounds the island, with depths under 1 fathom, extends 1¼ miles eastward of it and ⅔ mile northward. On the east and north sides of the flat are Mejlholm, Odden, and Hjelmshoved Islets, and to the southward the flat is connected with that surrounding Birkholm.

Drejö, a low and almost entirely flat island, without trees, lies nearly 1 mile westward of Hjortö, separated from it by Höje Stene Channel. Skoven, the western portion of the island, is connected to the eastern part by Drejet, a narrow strip of land. On the eastern part of the island is the village, with its church and mill.

The island is surrounded by a flat, on the northeast side of which are Grydholm and Græsholm, two islets; and from Nebbeodde, the west end of the island, Skarsand, a sandy shoal foul with rocks, extends for ⅔ mile. Mads Jensens Ground is a rocky shoal lying 800 yards westward of Nebbeodde.

From Skunsvig, on the south side of Drejet, the shore bank, with depths under 3 fathoms, extends about 1 mile off.

Buoy.—A red and white striped spar buoy, with one upturned broom over a straw wisp, is moored in a depth of 2 fathoms on the southeastern end of the spit extending from the south point of the island.

Höje Stene Channel, a channel trending to the south-southeastward, between Hjortö and Drejö, has a least depth of 7 feet, and is used by small vessels being buoyed by a private shipping company.

Drejö Harbor, on the east side of the island, has depths of from 4 to 6 feet, and is approached by a channel 950 yards in length, 21 feet in breadth, and with a depth of 6 feet, which leads from the southward; but the level of the water is raised 6 feet by northeast and lowered 5 feet by west winds. The village has a post, telegraph, and telephone offices, and fresh provisions and water can be obtained.

Pier.—On the east side of the island there is also a pier, which is 820 feet in length, and has a depth of 10 feet at its head, but the level is raised 8 feet by winds between east and northeast, and lowered 6 feet by those between west and southwest.

Billes Ground, four shoals, composed of sand and some rocks, lie between Korshavn and Skjoldnæs, the northwest point of Ærö, the least water, 1¾ fathoms, being on the southernmost shoal, the others having from 2½ to 3¼ fathoms; between Billes Ground and Skarsand, and southward of Mads Jensens Ground, are some patches of from 2¼ to 3½ fathoms.

Ærö—Northeast coast.—The northeast coast is mostly steep with low cliffs, and from Næbet, the eastern side of the northwest point, it trends for 7 miles in a southeast direction, to the south end of Revkrog, and then turns northeast to Ure Head, a narrow peninsula extending from the middle of the coast, in a northwest direction.

The shore bank on this part of the coast is generally narrow, but off Næbet, 1 mile eastward of Söby, and at Blakstens Point, it extends from ¼ to ⅓ mile off.

Pier.—A pier, about 260 feet in length, and with a depth of 3 fathoms at its extreme, extends from the shore southward of Næbet.

Söby Harbor, in Söby Bight, is formed by two breakwaters extending north by east and north by west, north for about 400 feet, with an entrance, facing north, about 30 feet in width between their heads. The depths in the entrance and in the harbor are 1½ fathoms, but gales from northeast to east raise the level 4 feet, and those from opposite directions lower it by the same amount; there is a warping buoy off the harbor.

Light.—From a pole 20 feet in height, situated on the east breakwater head, a fixed red light is exhibited, at an elevation of 20 feet above high water.

Coal and supplies.—A small supply of coal may be procured; fresh provisions and water can be obtained from the village, where there is a telephone office.

Ure Head, the extreme of the peninsula which forms the northeast side of Revkrog, is surrounded by a narrow shore bank, and fully 600 yards northwest of the point there is a detached shoal of 2¾ fathoms, inclosed by the 5-fathom contour line; at 1½ and 2¼ miles in the same direction from Ure Head are patches of 3¾ fathoms, 1⅓ miles off the coast abreast them.

Anchorages.—In Söby Bight anchorage can be obtained in depths of from 7 to 8 fathoms, over blue clay, with winds from southeast through south to west-northwest, and in Revkrog there is good anchorage in 4 fathoms, over mud and clay, except with north and northwest winds.

Coast.—Ommel Head is situated 1½ miles southeastward of the east end of the peninsula, of which Ure Head is the west extremity, and between these points the coast forms a bay which extends 2 miles southeastward, with a breadth of about 1¼ miles. Ommel Pier, which has a depth of about 7 feet alongside, is in this part of the bay.

Dejrö, lying about ⅓ mile southeast of the west point of this bay, is a small, low, uninhabited island, with some stunted trees or bushes on it, and low cliffs on its north side; there are channels to Ærösk-jöbing on either side of the island.

Lilleö, 1 mile southward of Dejrö, has on it a house surrounded by trees.

With the exception of a narrow channel on its west side the bay is filled with shoal water, and from the head of the bay a spit, with depths under 1 fathom, extends northwestward and surrounds Lilleö. Dejrö is on the northwest edge of the flat which fills the bay.

Ærösk jöbing Harbor, on the western side of the outer part of the bay, is formed by a breakwater extending eastward for 300 feet, southward of which another breakwater has a northeast by east direction for 200 feet and turns to the northward for 650 feet, with a short arm toward the head of the preceding, the entrance between them being about 40 feet, facing north.

The depth in the entrance is 2¼ fathoms, and there are 1½ and 2 fathoms inside, but gales from northeast to east raise the level 4 feet, and those from the opposite directions lower it the same.

Light.—From a white wooden building, 12 feet in height, on the angle of the south breakwater, a fixed red light is exhibited at an elevation of 14 feet above high water.

Buoyage.—Two perches, surmounted by brooms, mark the west side, and another, with a straw wisp, the east side of the channel.

Pilots.—Regular pilots can not be procured, but fishermen pilot vessels to the harbor.

Directions.—A narrow bank, with depths of from 6 to 8 fathoms, connects the northwest point of Ærö with Lyö and Avernakö, but eastward of it the water deepens to 16 and 18 fathoms, and the depths are about 12 fathoms along the northeast coast of Ærö, until abreast of Blakstens Odde, from which the 10-fathom contour line curves across the channel to Drejö.

The summit of Ommel Head, 28 feet high, bearing 139°, leads clear of Billes Ground and close northeastward of both patches northwest of Ure Head, so that after passing Billes Ground, Ommel Head should be brought to bear southward of the above bearing. A vessel will pass southward of both patches by keeping Marstal Mills in line with the Bjerget, a hill, 18 feet high, on the isthmus connecting Ure Head Peninsula with the land near Ærösk jöbing, 124°.

The same mills in line with Ommel Head, bearing 134°, lead northward of the shore bank, northward of Ure Head, in a depth of 8 fathoms.

Horne church open westward of Knolden, 344°, leads between Næbet and Billes Ground, and a vessel will pass southward of the latter shoal by keping Drejö church open one-third of the breadth of Skoven, southward of that island, 90°.

The leading marks for Ærösk jöbing are not given, as they would be liable to confuse, and a vessel would probably obtain a pilot or local assistance.

Town.—The town of Ærösk jöbing, which is close to the harbor, has communication by steamer with Svendborg, the steamer also acting as a tug; there is a post and telegraph office in the town, and fresh provisions can be procured, while water can be obtained from a well at the harbor.

There is a machine workshop in the town, a crane at the harbor, and two mooring buoys ooutside it.

Coal and supplies.—From 2,000 to 3,000 tons of coal are kept in stock; fresh provisions can be obtained, and water from a well near the harbor.

Channel between Ærö and Taasinge.—The area eastward of a line joining Ommel Head and the east point of Drejö, is shallow, and only navigable in parts by small vessels having local knowledge, or with the assistance of a pilot, so that the banks, and islands lying on them, are only briefly described.

Halmo, the southernmost of the islands, lying eastward of Ommel Head, is about a mile in length east and west, and has a cliff, 29 feet high, at its east end; a house stands near the middle of the island.

Store Egholm, lying on Flinte Ground, an extensive flat, with depths under 1 fathom, is low, situated 1½ miles northward of Ommel Head, and has a farm and two houses on it; Lille Egholm, an islet, is close to its southeast end.

Egholm Flat extends 1½ miles northwest of Store Egholm, within a depth of 3 fathoms, and on its northeast side is steep-to, breaking down abruptly from 3 to 7 fathoms; a small rocky patch, with a depth of 5 feet, lies on this edge.

Hjortö, on the north side of the entrance to Mörkedyb, has already been described.

Birkholm, with Græsholm, Bredholm, and Grensholm, small, low islands, lie on a flat, which extends from ½ mile northward of the first island to the east side of Strynö; on the southwest side of Bredholm, and on the center of Grensholm, are whitewashed marks. The spit of shoal extending southward of Gerensholm is named Grens Hook.

A small harbor and a pier on the south side of Birkholm, have a depth of 2 feet, but northeast winds raise the level of the water 8 feet, and those from southwest lower it 5 feet.

Morke Deep, a narrow channel through the flats, is entered from the northward, between the northeast of Egholm Flat, and the bank extending ⅔ mile southwest of Hjortö, passing between Egholm Flat and Flinte Ground with Store and Lille Egholm on the southwest, and Birkholm and the other islands on the flat, extending to Strynö, on the northeast side.

At the northern part of the channel, as far as the southeast point of Birkholm, the depths are from 6 to 7 fathoms, decreasing to 3 fathoms abreast of Bredholm, and to 11 feet at the southern entrance, and it is available for vessels of not more than 10 feet draft; the sides are steep-to throughout.

Buoyage.—A red and white striped fairway spar buoy, surmounted by a ball, marks the northern entrance.

The edges of Egholm Flat and of Flinte Ground, forming the southwest side of the channel, are marked by red spar buoys, surmounted by upturned brooms.

On the east side of the southern entrance the west and south sides of Grens Hook are marked by white spar buoys, with straw wisps, and on the north end of Vene Ground is a spar buoy, striped red and white, and surmounted by an upturned broom over a straw wisp, as a fairway buoy to the southern entrance.

Marstal Harbor.—From Ommel Head the coast trends southeastward for 3½ miles to Marstal Harbor at the east end of the island. The southern part of the harbor consists of Ærö Hale, a narrow strip of land extending eastward, from the extreme of which a stone breakwater stretches in a northerly direction for about 650 yards parallel to the town wharves, and between its head and a short mole from the island is an entrance about 80 feet in width.

There is a depth of 1¾ fathoms in the entrance channel, and in the harbor the depths are from 1½ to 1¾ fathoms, but on the east side along the breakwater it is shallow. Gales between northeast and north raise the level of the water 4 feet, and those from the opposite directions lower it by the same amount.

Leading lights.—Two fixed white leading lights, 133 yards apart are exhibited at elevations of 43 and 15 feet above high water, respectively, from white wooden dwellings, 8 feet in height, situated about ¾ mile northwest by north of the town; they are in line bearing 255°.

Two fixed red leading lights 30 yards apart are shown at elevations of 12 and 9 feet above high water, respectively, from poles situated on the mole on the western side of the entrance; they are in line bearing 169° and, with the above lights, are shown from October 1 to March 15, or so long as the mail steamer can use the port.

Bellbuoy.—A spar buoy, striped red and white, and surmounted by a ball, is moored on the west side of a detached shoal on the east side of the entrance, and close to this buoy is a red and white striped bellbuoy.

Buoys.—The channel is marked by white spar buoys, the northernmost having a straw wisp, and three warping buoys are moored on each side of it.

Pilots may be obtained, and take vessels to the adjacent harbors and as far as Skioldnæs.

Directions.—The fixed white leading lights in line, bearing 255°, lead southward of the buoy marking the shore bank southward of

Strynö, and to the line of the fixed red leading lights, which bearing about 169° lead through the entrance channel.

Marstal—Southern entrance.—The channel to Marstal from Marstal Bay, between the shore bank extending eastward of Ærö Hale and Langö Sand, has a least depth of 6 feet.

Buoyage.—On the south side its entrance is marked by a red spar buoy, surmounted by an upturned broom, and by two white spar buoys, surmounted by straw wisps, and the channel is marked by red and white spar buoys, according to the Danish system.

At the north entrance the fairway buoys consist of a spar buoy, striped red and white, with ball top mark and a small bellbuoy close to it.

Town.—The town of Marstal has regular steamship communication with Svendborg and Rudkjöbing; there is a post and telegraph office close to the harbor.

Coal and supplies.—Some coal might be obtained, and fresh provisions and water are plentiful.

Patent slips.—There are two patent slips. One has a cradle 130 feet in length, on blocks with depth at H. W. O. S. of 7 feet forward and 17½ feet aft, and a lifting power of 350 tons. The other is 80 feet in length, on blocks with depth forward of 7 feet and aft 15 feet, and lifting power of 120 tons.

CHAPTER X.

GERMAN COAST—ALSEN TO CAPE ARKONA.

Flensburger Fiord.—Between Pöhls Point, which, with Pöhls Reef, has been described, and Falshöft, 6½ miles southwest of it, is the entrance to Flensburger Fiord, extending west-northwest for about 15 miles, and then turning to the southwestward for 8 miles to Flensburg.

The fiord is divided into an outer and inner part, the northern shore of the former being formed by the south coast of Alsen, with Kekenis Peninsula, which stretches northwestward from Kekenis Point and Lighthouse; westward of the Peninsula is Sonderburger Bay. On the south side of the outer part is Birknack, 2 miles northwest of Falshöft, and westward of this Geltinger Bay.

The most prominent landmark on the north side is Lysabbel Church, which is white, with a dark gray roof, the tower, also white, having dormer windows; it is visible all along the south coast of Alsen. Kekenis Church, being surrounded by trees, only shows its white spire, but the houses of the village are visible; Hörup Church, not conspicuous, but standing high on Alsen, within Kekenis Peninsula, is white with a red roof, its black wooden belfry, the same height as the church, being separated from it.

Broacker Church, on Sundewitt, is white, with a pointed roof and two high gray sharp-pointed towers, inclining somewhat toward one another; a black wooden belfry stands apart from the church.

Düppel Mill, westward of the entrance to Alsen Sound, is situated on a bare hill, and has a monument consisting of a pyramid of yellow sandstone westward of it; Dünth Mill, on the south side of Wenningbund, is not so easily recognized, but it is near a bare hill southwestward of the high, steep shore about Gammelmark.

On the south side of the entrance Falshöft and Schleimunde Lighthouses are good marks, the latter particularly so, as it stands out clear from the land and has two or three buildings near it; Ohe Country House, Düttebüll Mill, and Beverö Mill, which latter is nearly a mile southward of Birknack, are also conspicuous objects.

North shore.—From Pöhls Point the coast, trending in a west-southwest direction, forms a small bight for 3 miles to Kekenis, the shore bank, to the depth of 3 fathoms, being generally about 800 yards off and the 5-fathom contour line about ¾ mile.

Kekenis, connected to the south point of Alsen by Drei, a narrow strip of land, consisting of pebbles, which extend as far as Pöhls Point, is the southeast extreme of Kekenis Peninsula, which stretches about 4 miles northwestward of it, with a greatest breadth of 1¾ miles.

Light.—On Kekenis a yellow cylindrical tower, 64 feet in height, with a white dwelling near it, exhibits at an elevation of 107 feet above high water a fixed white and group flashing light, visible 12 miles. (For bearings and period see Light List.)

Fleimose Sand, the eastern part of the shore bank, southward of Kekenis Peninsula, Fischer Sand being the western part, is ⅓ mile in width, with depths under 1 fathom, and steep-to along its southern edge; it is covered with rocks, but shows by its light color from a considerable distance, and a vessel will pass southward of it by keeping Pöhls Point open of Kekenis, bearing 63°.

Buoy.—A white can buoy, surmounted by two triangles pointing downward, is moored on the 5-fathom contour line ¾ mile southeastward of Kekenis Lighthouse.

Fischer Sand, sloping more gradually, extends within the 3-fathom contour line nearly ½ mile southward of the low point at Sönderby, and affords anchorage for coasters with offshore winds.

Breit Ground, a sandy bank fronting the entrance to Flensburger Fiord, extends nearly 4 miles in a south by east and opposite direction, with a greatest width of 2½ miles, within the 5-fathom contour line, the least depth of 2½ fathoms being near the center of the bank.

Buoys.—Breit Ground is marked by four white buoys, as follows:

North Buoy, conical, surmounted by two triangles, pointing upwards, and "N. Breitgrund," in white letters, on its side.

East Buoy, can, with two triangles pointing away from each other, and lettered "Breitgrund O."

West Buoy, conical, surmounted by two triangles pointing toward each other, and with "Breitgrund W." on it.

Whistlebuoy.—The south buoy, conical, surmounted by two triangles pointing downward, and with "Breitgrund S." on it, is a whistlebuoy.

Middle Ground, rocky, and with a least depth of 1½ fathoms over it, lies about 1½ miles southwestward of the coast of Kekenis Peninsula, separated from it by a narrow channel, in which there is a depth of 5½ fathoms; it is about 1,200 yards and 1.1 miles in length in an east and west direction, between the 3 and 5 fathom contour lines, respectively, and fronts the entrance to Sonderburger Bay.

Lightbuoy.—A conical, white lightbuoy, exhibiting a red group flashing light, showing two flashes every seven and a half seconds, and surmounted by two triangles pointing downward, is marked

"Mittelgrund S.," and moored near the 5-fathom contour line on that side of the shoal.

Buoys.—A white beacon buoy, surmounted by two triangles, pointing away from each other, and with "Mittelgrund O.," marks the east side.

On the northwest edge of the shoal is a conical white buoy, with two triangles pointing toward each other, and with "Mittelgrund W." on it.

Clearing marks.—Düppel Mill, in line with a conspicuous notch in the steep cliffy shore, eastward of Düppel, bearing about 308°, leads between Fischer Sand and Middle Ground in a depth of 5 fathoms, and also southwest of Breit Ground and northeast of Kalk Ground.

Hörup Haff, the fiord separating Kekenis Peninsula from the south coast of Alsen, extends 2 miles northeast, and then 4 miles southeast, to Drei Isthmus, and has a general width of a little less than 1 mile; it has depths of from 11 to 20 fathoms in its outer part, and from 6½ to 10 fathoms farther in, shoaling toward its head.

A tongue of shoal, with 4¼ fathoms at its extreme, extends 800 yards from the west point of Kekenis Peninsula, and on the shore bank, on the northwest side of the peninsula, which is about 200 yards in breadth and dries off the north point, are some large rocks.

The shore bank on the northeast side is generally about 600 yards in width, and on the north side of the fiord it does not exceed 400 yards in width. The 3-fathoms contour line is 1¼ miles from the head of the fiord, and the bottom is overgrown with weeds.

Buoys.—The shoal extending from the west end of Kekenis Peninsula is marked at its extreme by a white can buoy, surmounted by a ball over two triangles, pointing toward each other, and with "Kekenis W." on it.

The extreme of the shore bank, which dries off the north point, is marked by a spar buoy.

On the northwest side of the entrance to Hörup Haff a shoal of 4¼ fathoms, extending southward of Süder Holz, is marked by a white spar buoy, surmounted by two triangles, pointing downward, and marked "Süder Holz."

Piers.—A pier is situated about ½ mile east-southeast of Hörup Haff, and the ferry pier, westward of that place, has a depth of 10 feet alongside; at Steenhöft, 1½ miles southwestward, is another pier, off which lies a gray moring buoy.

Anchorage may be obtained in a depth of 5 fathoms off Hörup Haff, on the north shore, the holding ground being good.

Hörup Haff, a sea-bathing place, has about 200 inhabitants, and is connected with Kekenis Peninsula by a ferry; during summer there is also a steamer service, but not daily, to Sonderborg.

Supplies of fresh provisions, in limited quantities, may be obtained.

Sonderburger Bay.—A point on which is Süder Holz, an extensive wood, is on the northern side of the entrance to Hörup Haff and Sonderburger Bay, which latter is about 3¼ miles in width, between that point and Klein Borreshöft, the east point of the southern part of Sundewitt, southwest of it; from between these points the bucht extends 4 miles in a northwest direction, with the southern entrance to Alsen Sound on the north shore, and Wenningbund at its head.

About Lamberg Intägt, on the north side of Hörup Haff, the coast is somewhat high and steep, but southward of Sonderborg it slopes gradually; the depths in the bay are from 13 to 14 fathoms.

Alsen Sound—South entrance.—The south entrance to Alsen Sound, situated 1¾ miles northwest of the point of Süder Holz, is between East and West Hook, two banks extending off the east and west sides; the extreme of the former shoal to the 5-fathom contour line is 1,000 yards southwest of the coast ¾ mile southeast of the entrance, and the latter shoal is 600 yards from the west side.

Leading lights.—Two fixed red leading lights, exhibited from about ¼ mile eastward of the castle, are in line, bearing 20° and 400 yards apart.

The rear light, shown at an elevation of 74 feet above high water from a mast 49 feet in height, surmounted by a white square top mark, is visible 5 miles.

The front light, at an elevation of 29 feet, from a mast 33 feet in height, surmounted by a red triangle, is visible 5 miles.

A second pair of fixed red leading lights are exhibited close westward of the castle, at elevations of 31 and 23 feet above high water, from white iron lattice masts 25 and 19 feet in height, respectively, and having white and red top marks; they are in line bearing 344°, and are visible 5 miles. Both pairs of lights are unwatched.

Lightbuoy.—The southwest extreme of East Hook is marked by a red lightbuoy exhibiting an occulting white light every 8 seconds, which has "Sonderborg" in white letters on it.

Buoys.—The eastern edge of West Hook is marked by two black conical buoys, the outer marked "1" and the inner "2."

Northward of the lightbuoy the western side of the bank is marked by two red spar buoys marked "A" and "B," respectively.

The edge of the shore bank, on both sides of the entrance, is marked by buoys.

Entrance—Depths.—The outer part of the entrance, between the 5-fathom contour lines of East and West Hook, is about ¼ mile in width, with depths of from 9 to 10 fathoms; within this the channel gradually narrows and the depths decrease to 5¾ and 6½ fathoms between the entrance points, where the breadth is 100 yards. Abreast the castle the breadth is only about 50 yards.

Anchorage.—Sonderburg Road to the northward of the light-buoy marking East Hook affords good shelter in northerly winds in depths of from 2 to 4¼ fathoms.

Pilots may be obtained.

Directions.—The directions for entering Sonderburger Bay will be found with those for Flensburger Fiord, given below.

To enter Alsen Sound the mast, with a square red and white striped top mark, should be kept in line with the other mast, surmounted by a red and white striped triangle, bearing 20°, and when the two lattice-work iron masts are in line, 344°, the course should be altered for them, passing eastward of the black buoys marking West Hook, and edging to the westward to pass in mid-channel between the entrance points.

Wenningbund.—The coast of Sundewitt, from the entrance to Alsen Sound, trends southwest for a mile, and then west by north for 2 miles, forming the north side of Wenninbund, which extends nearly 2 miles in the latter direction, with a breadth of almost 1 mile.

On the north side the land rises abruptly to Duppel Heights, but within the head it is flat, becoming again high on the south side, and steeper toward Gammelmark; a number of fishermen live on the shores of this bay, but it is seldom used by vessels.

The depths in the bay are from 13 to 14 fathoms, the shore bank on the north and west sides extending about 400 yards, the inner part of the former bank being rocky; southward of Wenningbund the coast to Gross Borreshöft is lower after passing Steensigmoos, with woods in parts.

Fishery.—Herring and mackeral fishing takes place in Wenningbund in the months of June to October, inclusive. The drift nets are anchored at one end and are marked by floats.

Mooring buoys.—Three mooring buoys lie in a northeast by east and opposite direction, on the north side of the entrance to Wenningbund, and about 1 mile southward of Duppel Mill.

Helts Bank.—The coast bank on the coast southward of Wenningbund extends for nearly ½ mile in places to the 3-fathom contour line, and eastward of Klein and Gross Borreshöft is Helts Bank, fully 1 mile in length in a northeast and opposite direction, and 800 yards in greatest width within the depth of 5 fathoms; the least depth on the bank at 1,800 yards off-shore is 3 fathoms, and it is

separated from the shore bank by a channel with depths of from 6 to 8 fathoms.

Buoys.—The east side of the bank is marked by a white can buoy, surmounted by two triangles, pointing away from each other, and with "Helts Bank O" on it.

The fairway buoy to Flensburger Fiord lies on the southeast side of Helts Bank, and is a conical red buoy, with a ball as a top mark, and "Flensburg" in white letters on it.

A red can buoy, with staff and ball, is moored in a depth of 3 fathoms at a distance of about 700 yards northeastward of Gross Borreshöft. This buoy marks the western side of the channel between Helts Bank and the shoal extending from the shore.

South shore.—Birknack is the southern entrance point to Flensburger Fiord and 2 miles southeast of it is Falshöft, the coast between being low and flat; the shore bank is about 800 yards in width and steep-to, breaking down abruptly from 1¼ to 7 fathoms in places.

Light.—Nearly 1 mile southward of Falshöft is a light gray iron tower, with a red band between the galleries and extending below the lower gallery, which exhibits, at an elevation of 82 feet above high water, an unwatched group occulting light with white and red sectors, visible 15 miles. (For sectors, see Light List.)

Kalk Ground, with general depths of from 1¼ to 3 fathoms, extends in a tongue, about ½ mile in breadth, for a distance of 1.9 miles north-northwest of Birknack; about a ¼ mile within its extreme is a narrow ridge, about ⅓ mile in length, on which the depths are from ½ fathom to 1 fathom.

A shoal, with a least depth of 31 feet, lies about 1,500 yards 235° from Kalk Ground Lightvessel.

Lightvessel.—A red lightvessel, with three masts, balls at the fore and mizen mastheads, and "Kalkground" on the sides, is moored about 200 yards northward of the 5-fathom contour line inclosing the shoal; it exhibits from the fore and mizen masts, at an elevation of 26 feet above sea level, two fixed white lights, visible 7 miles. The lightvessel is removed when there is any strong formation of ice.

Fog signal.—A foghorn gives three blasts, low-high-low, of 3 seconds, at intervals of 2½ seconds in every minute.

In the event of the horn being disabled a bell is rung continuously for 10 seconds, at intervals of 30 seconds, and should a vessel's fog signals be heard on board the lightvessel a gun will be fired every 5 minutes; guns are also fired.

Submarine fog bell.—A fog bell gives two groups of three strokes each every 45 seconds; the silent interval is 3 seconds between the strokes, and the first three strokes are followed by an interval of 6 seconds, the second three by one of 27 seconds. (See Chapter I.)

Signal station.—Kalkgrund Lightvessel is provided with Morse night signal apparatus, and vessels can communicate by that means.

Pilots.—Birknack is a pilot station, and two pilots are stationed on board the lightvessel, so that vessels may receive a pilot from either.

Geltinger Bay, between Birknack and Habernis, 4 miles westward, recedes nearly 3 miles to the southward, and on its east side has low, bare land about the former point, but some woods further south; the west side is steeper. On the southeast side of the bay is Gelting Village and Church, and where the land is low dykes have been constructed to prevent flooding.

The shore bank on the east side from Kalk Ground southward is about ½ mile in width and about the same off Ohrfeld Hall, the head of the bay, but on the west side it is narrower.

Jürgens Schott, the outermost of several patches lying in the head of the bay, has a least depth of 2½ fathoms over it, and is situated in the middle of the head of the bay, and 1¼ miles offshore.

Anchorage.—The bay is capable of affording anchorage for large vessels or a fleet, but the sea caused by northerly winds renders it an unpleasant anchorage for small vessels.

The best anchorage for large vessels is in a depth of 8 fathoms, over ooze, with Broacker Church in line with the south end of Borreshöft Wood, bearing 313°, and Hörup Church open of the west side of Kekenis Church, about 6°; small vessels anchoring anywhere nearer the land in convenient depths, where the bottom will probably be sand covered with grass.

Directions.—From the northward, Skioldnæs in line with the southern side of a conspicuous ridge on Fyen, eastward of Diernisse Church, bearing about 26°, leads southeast of Pöhls Reef; and Pöhls Huk, midway between Skioldnæes and Söby Church, about 50°, leads between the shoal southeast of Kekenis and the north side of Breit Ground.

Having passed between the above shoals, steer to the westward to bring Dünth Mill in line with the highland of Gammelmark, bearing about 292°, which leads northward of Kalk Ground and southward of Middle Ground, and when about midway between Middle Ground and Helts Bank, with Lysabbel and Kekenis Churches in line, 62°, if bound to Alsen Sound steer about 329° for the entrance.

From the southward, and with Schleimunde Lighthouse bearing 236°, distant 2½ miles, steer 329° for about 8½ miles, or until Lysabbel Church and Kekenis Lighthouse are in line, 10°, when, if intending to pass between Fischer Sand and Middle Ground, alter course to about 309° for Duppel Mill, which latter, in line with a conspicuous notch in the steep cliffy shore eastward of Duppel, 308°,

leads through the channel, and the course may be continued until Sonderburg Fairway buoy is sighted.

If passing southwest of Middle Ground, when Lysabbel Church and Kekenis Lighthouse are in line 10°, steer to bring Dünth Mill in line with the highland of Gammelmark, and proceed as before.

By night.—If from the northward, steer in the fixed white sector of Kekenis Light, between the bearings of 273° and 290°, until Pöhls Huk leading lights come in line bearing 44°, when alter course to 224°, and when Kekenis Light changes from groups of four flashes to groups of two flashes 337° the vessel will be southwestward of Kekenis south buoy, and may steer to the westward to pass northward of Kalk Ground Lightvessel and into the fixed white sector of Kekenis Light, between 75° and 80°.

Keeping in this white sector will lead to the entrance of Flensburger Fiord, or when in the occulting white sector of Falshöft Light, between the bearings of 123° and 133°, edge to the northward, steering about 313°, and keeping on the northeast limit of the occulting white light, which will lead between Helts Bank and Middle Ground, if bound to Sonderburg.

Flensburger Fiord—Inner part.—The inner portion of Flensburger Fiord is entered between Gross Borreshöft and Habernis, 2¾ miles to the southward, and trending first northwest for about 5½ miles it turns northeast, and through north and west to southwest, rounding the end of Holnis Peninsula; the narrowest part between Holnis Peninsula and Dalsgaard is about 1,600 yards in width, the navigable channel at this part being not more than 200 yards.

North shore.—From Gross Borreshöft the south coast of Sundewitt, which forms the north side of Flensburger Fiord, trends in a west-northwest direction for 4 miles, indented at about mid-distance by Schelde Bay; it then turns to the north-northwest for 3 miles to Eken Sound, with a large bight between; the north shore has fewer steep cliffs and larger woods than the south side.

Krage Sand, extending for 600 yards southward of the point westward of Gross Borreshöft, has a depth of 1¼ fathoms near its outer edge, and breaks down abruptly to 6 fathoms.

Buoy.—The south side of Krage Sand is marked by a red spar buoy surmounted by a staff and ball.

Schelde Bay, about 1½ miles in width, and receding ½ mile, is nearly filled with the shore bank, with depths under 3 fathoms, but affords anchorage in a small space for small vessels during northerly winds.

Brunsnis Flat is the shore bank which extends ½ mile southward of the western part of this coast; it slopes gradually, the 5-fathom contour line being about 1,400 yards from the shore.

A spur of shoal water, with depths under 5 fathoms, extends from the shore immediately southward of Brunsnis Wharf, in a westerly direction, into the channel for nearly 1,800 yards.

Lightbuoy.—The west extreme of the shoal spur is marked by a lightbuoy, painted red and marked "D," exhibiting a group flashing white light, 2 flashes every 12 seconds.

Buoy.—A red can buoy, surmounted by a staff, is moored on its southern edge.

Brunsnis Wharf, situated where the coast alters its direction to northeast, is used by steamers running between Flensburg and Sonderburg, and has a depth of 1¾ fathoms at its extreme.

Middle Ground.—Iller, consisting of several brickworks, buildings, landing piers, and some woods, is situated on the coast northeast of Brunsnis Wharf, and between this and the extreme of Holnis Peninsula, on the west side of the fiord, are two shoals, with depths of 3½ and 3¾ fathoms, respectively, lying nearly in mid-channel, and about 200 yards westward of the 3½-fathom shoal is a patch of 4¾ fathoms nearly on the line of Schottsbüll leading lights.

Buoys.—Red and black striped can buoys, each with a staff, are moored on the patches and may be passed on either side, but vessels of deep draft should give the buoys a moderate berth.

Neissmühlen Flat extends from the shore for about 800 yards, from a mile northwest of Iller, toward Holnis Hook, a shoal from the opposite shore, and narrows the navigable width of the fiord between the 5-fathom contour lines, to about ⅓ mile.

Buoy.—Neissmühlen Flat is marked on its southwest side by a red can buoy, surmounted by a staff and a ball.

Rennberg, 1½ miles northwest of Iller, consists of a continuous row of brick kilns, occupying a considerable stretch of the coast, which, from previously sloping evenly to the beach, here becomes steep, the cliffy shore being composed of clay, and the deep water within 200 yards from it; there are several piers with depths of 2 fathoms at their outer ends.

Laagmai is situated ½ mile northwest of Rennberg.

South shore.—Habernis, the south entrance point to the inner part of the fiord, is cliffy, and westward of it is a small bay, on the shore of which Habernis Village stands on high ground; Neukirchen village and church are on the west side of the bay. The church, painted red, with a gray pointed roof, forms a conspicuous mark, and is of simple architecture, with a square tower and no windows showing seaward.

Scheersberg View Tower, about 3 miles southwest of Habernis, can only be seen in very clear weather.

The south coast continues high, and is wooded to the westward of Neukirchen as far as Bockholmwick Village, a distance of 5 miles, where it gives place to meadows and pasture land; at Langballigholz, 3½ miles from Neukirchen, is Langballig Au, a small river, and westward of its mouth a pier, with a channel having a depth of 1½ fathoms leading to it, but on the east side of the pierhead there is only 3 feet.

Reef.—From Habernis a rocky reef extends for ¼ mile northeastward and is continued by shoal water with 1½ fathoms for a similar distance, the 5-fathom contour line being ½ mile off.

Neukirchen Ground, 1.1 miles northward of the shore of the bay at Habernis Village, is a small detached stony shoal, with a least depth of 2 fathoms, separated from the south shore by a channel in which the depths are from 11 to 14 fathoms.

Buoy.—A conical black buoy, surmounted by a staff, is moored on the north side of Neukirchen Ground.

A red and black vertical striped beacon buoy, with east topmark (two triangle bases together) marked "Neukirchen-grund O," is moored at the eastern end of the shoal.

Langballig Bank, lying parallel to and 1,200 yards from, the south shore, abreast of Langballigholz, is 1¼ miles in length in a northwest and opposite direction and about 400 yards in greatest width, within the 5-fathom contour line; the depths on the shoal are from 4 to 4½ fathoms, over gravel bottom.

Buoys.—The southeast end of Langballig Bank is marked by a conical red and black striped buoy, surmounted by a staff and a cross and marked "Lanballig O."

The northwest end is marked by a similar buoy, but marked "Langballig W."

Holnis.—From Bockholmwiek the coast, which is steep as far as Bockholm, turns to the north-northeastward for nearly 3 miles to the extreme of Holnis Peninsula, forming a bight between, receding about ⅝ mile; this part of the coast is flat, and 1¾ miles from Bockholmwiek is Drei, an isthmus about 60 yards in width, which connects it to Holnis Peninsula.

Some houses are situated southward of Drei, which has a road along it, the peninsula rising from its south side and falling to the north somewhat abruptly; there is a farm, with a white house surrounded by trees, on Holnis.

Holnis Hook, a rocky reef mostly dry at low water, extends for about 800 yards northeast of the extreme of Holnis; it is steep-to at its end, breaking down suddenly from 1 fathom to 6 fathoms.

Lightbuoy.—The northeast extreme of the shoal is marked by a lightbuoy painted black and exhibiting a group flashing red light, two flashes every seven seconds.

Schidenkind.—On the north side of Holnis Peninsula, where the ground is flat and swampy, the shore bank, from the extreme of Holnis Hook, where it is about ¼ mile in breadth, gradually draws off the coast, and 1¼ miles westward it is ½ mile offshore, forming Schidenkind, a spit of clay and gravel, with depths of from 1¾ to 2¾ fathoms over it; the east and west sides can be approached by the lead, but the north side is steep-to, deepening abruptly to 9 and 10 fathoms.

Buoys.—The north extreme of Schidenkind is marked by two conical black buoys, numbered 3 and 4, and southward of these are two black buoys with triangles pointing downward as top marks; a buoy at the western extreme of the shoal has a staff and ball top mark.

No. 3 is a lightbuoy painted black and marked "3," exhibiting a group flashing white light, two flashes every seven seconds.

Light.—Holnis Light, on the west side of the coast, ⅜ mile north by west of Drei, is a fixed, flashing, and group flashing white light, with red sectors, exhibited at an elevation of 65 feet above high water, from a square tower, 42 feet in height, built of yellow bricks, and with two white dwellings adjacent; the white light is visible 8 miles and the red light 6 miles. (For sectors and duration of light and eclipse, see Light List.)

A fixed red light is exhibited, at an elevation of 23 feet above high water, from a white iron mast, 23 feet in height, situated 260 yards 10° of the main light, to serve as a leading light; it is visible 3 miles.

Customs station.—About ½ mile southwest of the northeast extreme of Holnis is a customs station, with two piers, having a depth of about 3 feet alongside them, and a flagstaff on the inner end of each, on which a flag is hoisted denoting that the pier showing it is in use; by night a red light is hoisted over a white light at the north pier, and the converse at the south pier.

Storm signals are shown from a signal staff, having a white hut close to it, and situated on high ground near the northeast extreme of Holnis Peninsula; weather charts are kept at a house eastward of the mast.

Anchorages.—In northwest winds small vessels can anchor off the northern pier, but with easterly winds there is a considerable amount of sea, and the best anchorage then would be off the shore bank, on the north side of Holnis.

Ekensund is entered about 1½ miles northward of Holnis, and on the west side of the entrance is Rinkenis Bight, a shallow bay, partly filled with sea grass; the land in this bay is low, but higher to the southward near Dalsgaard Village.

Within its narrow entrance the sound extends to the northwest, in Sildekule, a bay about ½ mile in extent, on the eastern entrance point

of which are brickkilns, and northward of these is Sternholz, a park-like wood; about ¼ mile within the northwest side of Sildekule is the town of Gravenstein. There is a depth of 3¾ fathoms in the middle of Sildekule, in a very narrow space.

Nubel Noor, a considerable sheet of water on the northeast side of Ekensund, has depths of from 3¾ to 6½ fathoms, in a central basin, but is not used by shipping; the southeast part, extending for 1½ miles, has depths of 2½ fathoms, except near the shores. The villages of Atzbüll and Nubel are situated, respectively, on the north and east sides of Nubel Noor.

Dangers.—The shore bank, on the east side, between Rennberg and the entrance, is very narrow, and off the entrance point, where it is named East Hook, it is barely 200 yards in width.

Buoys.—The southwest side of East Hook is marked by two red can buoys, each surmounted by a staff and ball.

Dalsgaard Ground extends from the shore southward of Rinkenis Bight for a distance of fully 800 yards and is steep-to; about 400 and 600 yards eastward of Dalsgaard Ground are two patches, with depths of 2½ fathoms.

A patch with a least depth of 3¾ fathoms lies nearly midway between the eastern 3-fathom patch and Neissmühlen Flat.

Buoys.—The eastern 3-fathom patch is marked on its east side by a red and black can buoy, surmounted by a staff and marked "Ekensund" in white letters.

The southeast side of Dalsgaard Ground is marked by a red can buoy surmounted by a staff with two balls.

West Hook is the northern part of the shoal which fills Rinkenis Bight, extending ¾ mile from its head.

Buoys.—The east side of West Hook is marked by two conical black buoys.

Leading lights.—On the west side of the entrance to Ekensund there is a fixed white and a red leading light, and within a light with white and red sectors.

Entrance—Depths.—The entrance to Ekensund is 100 yards in width, but within widens on the western side to a small harbor with depths of from 1 to 1½ fathoms; between Fisnis, the point on the east side of the entrance to Sildekule and Egensund, the channel is 400 yards in width, but much reduced by a middle ground.

The depths in the outer part of the channel are from 5¼ to 8 fathoms, and southward of the middle ground at the entrance to Nubel Noor not less than 3¾ fathoms, while northward of it they are from 2 to 5 fathoms, this latter channel being used by small steamers running between Gravenstein and Nubel.

Anchorage.—Depths of from 4 to 5 fathoms are found in the space southward of Ekensund Entrance, the bottom consisting of clay and ooze, so that the whole of it is suitable for anchorage.

Pilots may be obtained, and will come out to a vessel on the usual signal being made.

Directions.—Without having local knowledge it would be advisable to employ a pilot. By night the fixed white and red lights lead to the entrance and to the red sector of the inner light, which should be steered for; it changes to white when abreast it.

Ekensund, on the east side of the channel, has a population of about 1,000, chiefly employed in the brickworks; it has communication by steamer with Flensburg and Gravenstein, a post and telegraph office, and a small quantity of fresh provisions might be obtained.

A ferry crosses the sound at its narrowest part, conveying vehicles.

Gravenstein, a town of about 1,400 inhabitants, on the northwest side of Sildekule, has steamer and railway communication with Flensburg, and post, telegraph, and telephone offices; there are large hotels in the town.

Piers.—At Ekensund is a pier alongside which steamers secure.

A pier in Sildekule has a depth of 1½ fathoms at its extreme.

In Nubel Noor there are piers at Bachmans (7 feet), at Petersens (2 feet), and at Thornschan Brickworks (9½ feet). At Nubel is a steamer pier, besides others, and where there is not sufficient depth of water for vessels to load alongside, ditches are cut into the land close to the brickworks, so that boats can go in to load.

Channel.—Between the southern part of Dalsgaard Ground and Schidenkind is the entrance to a channel which is the narrowest part of the fiord, being barely 200 yards in width, and having in it some spots with a depth of 23 feet; the least water on the line of Laagmai Light Tower and mast in one, 47°, is 26 feet.

Leading lights.—Near Schottsbüll, and between it and Rennberg, two white unwatched leading lights are shown, from white towers 28 and 23 feet in height, respectively; they are in line when bearing 27° and 984 yards apart.

The rear light, fixed white, exhibited at an elevation of 80 feet above high water, is visible 14 miles.

The front light is occulting white, exhibited at an elevation of 38 feet, and is visible 11 miles.

At Laagmai two unwatched leading lights are exhibited from a skeleton iron mast, 52 feet, and a cylindrical tower, 28 feet, in height, both painted white; the lights are in line bearing 48°, and 760 yards apart.

The rear light, fixed white, is exhibited at an elevation of 70 feet, and the front, alternating white and red, at 44 feet; they are visible, respectively, 14 and 11 miles.

Leading lights.—At Rinkenis, on the west side of the entrance to Ekensund, two unwatched leading lights are shown from a skele

ton iron mast, 23 feet, and a cylindrical tower, 28 feet, in height, both painted white; they are 1,100 yards apart, and in line, bearing 289°.

The rear light, exhibited at an elevation of 98 feet, is fixed white, and the front light, at an elevation of 33 feet above high water, is occulting white, with a green sector; the fixed light is visible 14, the occulting light 11, and the green sector 7 miles.

Buoyage.—The northwest side of this channel is marked by five red buoys, the northeast buoy being that marking the southeast side of Dalsgaard Ground, and the other buoys, respectively, spar, surmounted by a ball; two can buoys, each with a ball; and a lightbuoy painted black and marked "L" exhibiting a group flashing white light, three flashes every 12 seconds.

On the southeast side, nearly on the leading line, the buoys are conical and as follows: Black, numbered 3 and 4 (already mentioned as marking Schidenkind, No. 3 being a lightbuoy); red and black, with a cross; black, no top mark; red, marked B; black, numbered 7; black, no top mark; and the southwest buoy red, spar, marked M.

North shore—Dalsgaad to Kupfermühlen Bight.—The general direction of the north shore of the fiord from Dalsgaard to Kupfermühlen Bight, a distance of 6½ miles, is west-southwest, but for 3 miles between Brennstoft Huk and Kuhhaken it is broken by a bight, receding ⅔ mile, and having Ochsen Islands in its western part.

Pier.—At Sandacker, ⅔ mile southwest of Dalsgaard, is a pier with a depth of 13 feet alongside, which is used by the Gravenstein, Flensburg, and Sonderburg steamers. It has two restaurants on the foreshore near it.

Brennstoft Huk, ½ mile southwest of Sandacker Pier, has a narrow shore bank, which is steep-to, and here the fiord, which, from Dalsgaard, has been about ⅔ mile in width, broadens out, and for 5 miles has a general breadth of about 1½ miles.

Fish traps are placed all along this north shore from Ekensund, especially where the coast bank is steep-to, extending into depths of from 2 to 3 fathoms; some can be passed quite close-to.

Ochsen Islands, lying on a bank, about 2 miles west-southwest of Brennstoft Huk, and separated from Süderhaff Hook shore bank by a narrow channel, with a depth of 3¼ fathoms, consists of two, of which the western is slightly larger. The eastern island is 60 feet high.

On the larger island there is a yard for the repair of vessels, and on the smaller a villa.

At Kollund, nearly 1 mile westward of Ochsen Islands, a view tower and bathing place are conspicuous.

Buoys.—The shore bank off Süderhaff Hook, and that extending eastward of Kuhhaken, nearly 1 mile further west-southwestward, are marked by spar buoys, surmounted by a spherical basket.

Anchorage.—There is good anchorage for small vessels in a depth of 3¼ fathoms, northward of the islands.

South shore.—Between the northwest end of Holnis Peninsula and Schausende Brickworks, 1½ miles southwestward, the coast is low, and broken by a shallow inlet, but further southwest it becomes high and steep, and is backed by Glücksburger Wood.

Depths offshore.—Westward of Holnis Lighthouse the shore bank extends ⅓ mile to the 3-fathom and ⅔ mile to the 5-fathom contour lines, but off Schausende it becomes narrower, and closes the coast to about 400 yards, while farther southwest to Meyer Bight it is very narrow.

Anchorage.—Good anchorage, in convenient depths, may be obtained off this shore between Holnis and Moos Brickyard, but with southwest winds there is an unpleasant sea, and then anchorage should be sought on the northern shore within Oschsen islands.

Glücksburg, situated in a bay near Glücksburger Wood, is a sea-bathing place, with about 1,200 inhabitants, and has a landing pier at which there is a depth of 11 feet; there is steamship communication with Flensburg and also post and telegraph offices in the town, which has large hotels on the foreshore near the pier.

View Tower, situated about 200 yards northeastward of the landing place, is an iron framework with a spiral stair.

Buoys—Wharf.—A channel with least depth of 9 feet leading to a new wharf, having a depth of 9 feet at its outer end, is marked on the starboard side by a small red spar buoy and on the port side by a small black conical buoy.

Prohibited anchorage.—Two beacons, painted white, the higher having a quadrangular and the lower a triangular top mark, are situated near the men's bathing place, and a similar pair of beacons stand near the women's bathing place, the former pair in line marking the northern and the southern pair in line the southern limit of an area in which it is prohibited to anchor.

Two black beacons, the front with a triangle and the rear with a ball, are near the children's bathing place, and in line mark the western boundary of the same area.

Meyer Bight, a bay situated between Glücksburger Wood and the high, bare land about Twedterholz, is filled on its western side by Fries Hook; the shore bank, extending ⅓ mile northward and westward of this, is a broad, sandy beach, named Farensort, extending in a spit.

The high pointed tower of Mürwik Naval Academy shows up over the ridge of Farensort.

Head of the fiord—West shore.—From Kupfermühlen Bight the west shore trends to the southward for 1½ miles to Batterie Huk, its center part being high, steep, and wooded, but lowering to the southward; northward of Batterie Huk are the Flensburg sea baths and a shipbuilding yard, the latter having a tall chimney.

Batterie Hook.—The 5-fathom contour line on this stretch is about ⅓ mile off, the shore bank being irregular, and Batterie Hook extends in a northeast direction from Batterie Huk for 300 yards with a depth of 1 fathom, deepening rapidly from 1 to 4 fathoms.

East shore.—Southward of Farensort are Osbek and Mürwik Brickworks, and here is the torpedo-practicing grounds of the German Navy, with a small torpedo-boat harbor and mooring buoys.

The land behind is high and terminates in Kielseng, the western cliff of which is covered with bushes.

On the high ground to the northward of the torpedo establishment is the Imperial Naval Academy, the tower of which is seen over Farensort, and eastward of the academy stand the barracks of the boys' training division; a water tower is also conspicuous, the pumping station being near the shore.

Murwik—Time signal.—A gun is fired from the training ship at 1h. 0m. 0s. standard mean time from the training ship.

Middle Ground, in the middle of the head of the fiord, about ¾ mile north-northeast of Batterie Huk, has a least depth of 2¾ fathoms over ooze and gravel.

Osbek Ground, a detached shoal with a depth of 3 fathoms, lies ½ mile east-northeast of Batterie Huk and 600 yards off the torpedo depot; between it and Batterie Huk is a patch with a depth of 2½ fathoms over it.

Buoys.—The northeast side of Osbek Ground is marked by a can buoy, surmounted by a staff, and the east side has a similar buoy.

Depths.—The depths in the fiord from Gross Borreshoft as far as the east end of Langballig Bank, are from 11 to 13 fathoms, and from that to Holnis from 7 to 10 fathoms; in the narrowest part of the fiord, which is the channel, only 200 yards in width, commencing between Holnis Hook and Schidenkind on the south and Dalsgaard Ground on the north, the depths are from 23 to 26 feet, the latter on the line of the leading lights, but the level of the water may vary from 6 to 8 feet.

The water sometimes falls from 6 to 8 feet below the normal level, with winds from northwest to west, but with southwest winds it commences to rise, continuing to do so if the wind shifts to south and east, and attaining similar heights above mean level; it is highest with northeast winds, and the highest or lowest level may be reached without a gale occurring.

At the head of the fiord and in Flensburg Harbor the level may be from 5 to 6 feet less than the soundings shown on the chart during westerly gales. (See Fluctuations in Level, Chapter I.)

Flensburg Harbor, which commences at a line joining Batterie Huk and Kielseng, extends for about 1 mile in a southerly direction, the entrance between the points being ¼ mile in width, but the channel is only about 200 yards, although the harbor widens slightly within.

A number of wharves, which have depths of from 13 to 16 feet alongside, front the town, the railway runing on them; vessels lie with their heads to the wharves and sternfasts to buoys, and in a large vessel it would be advisable to have an anchor down as well.

Leading lights.—Two unwatched fixed red leading lights are shown from the red iron poles, 57 and 22 feet in height, the rear light at an elevation of 91 feet and the front light at 64 feet above high water; they are visible 5 miles.

In line 210° they lead over the southeast edge of Osbek Ground in a depth of 3 fathoms.

Storm signals are shown from near the harbor office. (See Chapter I.)

Buoys.—The west side of the channel is marked by a conical red buoy, surmounted by a staff and ball.

The east side has two conical black buoys, surmounted by staves.

Mooring buoys.—A line of mooring buoys extends along the west side of the harbor.

Depths.—The depths in the approach are from 6½ to 10 fathoms, and from 3¼ to 4½ fathoms, over black oaze, in the channel of the harbor; in one or two places in the inner harbor there is as much as 6 fathoms.

Pilots may be obtained.

Ice.—Average ice conditions, see Appendix.

Town.—The town of Flensburg, with a population of about 50,000, is on the west side of the harbor, and has three churches, all with slender, pointed spires, on cupolas, the highest being Nicola Church; there are also a number of factories in the town, which have slender chimneys.

Communication.—There is steamship communication with Kiel, Sonderburg, Stettin, Lübeck, Faaborg, Apenrade, and also with several other places in the vicinity. A railway runs to Kiel and to Eckernförde, and a light railway connects the town with Sonderburg; the railway station is at the inner end of the harbor. A tramway runs the whole length of the town.

Coal and supplies.—About 8,000 tons of coal are kept in stock and 160,000 tons imported annually; coaling is carried on by baskets,

and 1,000 tons could be put on board in 24 hours. A coal wharf has a depth of 18 feet alongside.

Fresh provisions, bread, and vegetables can be obtained, and very good water from a hose on the quay.

Dock.—There is a floating dock, with dimensions as follows: Length on blocks, 279 feet; over all, 282 feet. Breadth, 94 feet. Depth at H. W. O. S., on sill 20 feet; on blocks 19 feet. Lifting power 2,300 tons.

Repairs.—The Flensburg Shipbuilding Co. build and repair vessels. There are two steam cranes lifting 100 and 40 tons, and the town crane will lift 7½ tons. Divers and apparatus can be obtained, and the Flensburg-Ekensund Steamship Co. have salvage facilities, with a salvage steamer fitted with powerful pumps.

Hospital.—There is a garrison hospital.

Directions.—Vessels of more than 20 feet draft, proceeding in the fiord above Holnis, should employ a pilot, as not only is the channel narrow in places, but the depths alter considerably owing to the influence of the wind from various directions.

Even should a large vessel have proceeded without the assistance of a pilot as far as Farensort it would there be prudent to employ one, as with westerly winds in that locality the depths may be from 3 to 6 feet less than those shown on the chart.

Coming from the northward, Kekenis Lighthouse bearing 79° astern will lead to the entrance of the inner part of Flensburger Fiord, and when Holnis Lighthouse bears 290° it should be steered for.

On the above course a vessel will pass southward of Krage Sand and Brunsnis Flat, and northward of Neukirchen Ground and Langballig Bank, and when Schottsbüll White Lower Light Tower is in line with a high chimney to the westward of Schottsbüll High Light Tower, bearing 26°, alter course on this mark, which leads westward of the shoal extending west of Brunsnis and between Holnis Hook and the middle grounds.

Immediately after passing Holnis Hook, Rinkenis White Tower and Mast should come in line 289°, and course being altered for them will lead southward of Ekensund Fairway Buoy and northward of Holnis Hook and Schidenkind, and to the line of Laagmai Light Tower and Mast in one, 47°.

When steering 237°, with Laagmai Light Tower and Mast in line as a stern mark, the course must be most carefully adhered to and the buoys marking Dalsgaard Ground and Schidenkind must be avoided, the turning from the first to the second leading line being close to the former buoy and the leading line of the 227° course passing close to the latter buoys.

Having passed between the red and black buoys, southeast of Brennstoft Huk, the course should be altered to about 231°, to pass northward of Farensort, where it would be advisable to obtain a pilot for the harbor.

From the southward, and with Lysabbel Church and Kekenis Lighthouse in line 10°, the latter distant 2½ miles, steer to bring Dunth Mill in line with the high land of Gammelmark, 292°, passing about 300 yards northward of Kalk Ground Lightvessel, from which a 267° course will lead southward of Krage Sand, and bringing Holnis Lighthouse to bear 290°, proceed as previously directed.

By night.—The channel southward of Breit Ground being wider and deeper than that to the northward, it is preferable for large vessels by day as well as by night.

Kekenis Lighthouse should be approached, bearing 337°, which is the line of separation between the groups of four and two white flashes, until Falstöft Light, fixed white, bears about 242°, when alter course to 309°, passing through the red sector of Falstöft Light, and into its northern white sector, which bearing, 151°, and used as a stern mark, leads northeastward of Kalk Ground.

The 231° course may be continued until in the fixed white sector of light from Kekenis Lighthouse, between 75° and 80°, and steering about 259°, in this white sector, will lead into the fixed white sector from Holnis Light, between 289° and 294°, which may be steered for, 291°.

When Schottsbüll fixed and occulting leading lights are in line, bearing 27°, alter course for them, and continue that course until Rinkenis Leading Lights come in line, 289°, following this latter line until on that of Laagmai Lights, 48°; the alteration of course from Schottsbüll to Rinkenis Leading Lights, begins directly Schottsbüll Lower Light disappears.

Laagmai Leading Lights kept astern, steering 228°, will lead through the narrow part of the channel, and into the fixed white sector of Holnis Light, between 59° and 67°, this sector leading down the fiord, but in a vessel of over 13 feet draft, when Holnis Light disappears it would be prudent to anchor.

Steering on the line of Laagmai Lights, they should be kept carefully in one until Holnis Light bears 169°, when the high light should be preferably kept open southward of its low light, keeping it thus until in the fixed red sector of Holnis Light, when Laagmai Lights may again be brought in line.

A small vessel, after passing northward of the two buoys marking the north end of Schindenkind, with Laagmai Lights in line, can steer to the southward from the channel, with Holnis fixed red light in line with the fixed white light from the main tower, bearing

190°, which will lead along the west side of Schindenkind, and into the fiord southward of the main channel.

Directions for entering the fiord by night, to the northward of Breit Ground, have been given above.

Ice is not usually present in the fiord before the middle of January, but with a frost setting in at that time it generally freezes over in 24 hours, forming, as a rule, more rapidly on the western than on the eastern side, a fact explained by the prevalence of easterly winds with the setting in of frosty weather.

The breaking up usually takes place about the commencement of March, the ice melting first at, and detaching itself from, the shores, the coating of the fiord being driven out over its breadth by the prevailing westerly winds, and either piling up on or near banks, or disappearing in the Baltic.

Should easterly winds set in at this time, the ice may be driven back by them into the fiord, and under such circumstances a barrier constituting an impediment to traffic, may be formed, especially in that part of the fiord between Brunsnis and Holnis.

The ice does not affect the depths in the fiord in any way. (See Average ice conditions, Appendix.)

Kiel Bay is the area contained between the south ends of Little and Langelands Belts and the islands dividing them on the north: the coast of Schleswig, between Flensburg and Kiel Fiords on the west; Fehmarn Belt, Island, and Sound on the east; and the German coast between these west and east limits on the south.

Coast.—From Falshoft the coast trends in a south-southeast direction, for 6 miles, to Lootsen Island, the coast bank to the 3-fathom contour line having an almost uniform breadth of ⅔ mile.

Schleimünde.—Lootsen Island lies on a flat which extends 1 mile southward, forming the northern side of Schleimünde, the entrance to Schlei River, which is 22 miles in length and extends from its mouth to Schleswig; the southern side of the entrance consists of a narrow strip of land, extending about 1¾ miles northward from the coast.

Schleimünde Lighthouse, as already stated, is a very conspicuous object, as is also the pilot's house, standing about 300 yards northwest of it, and 3 miles farther in the same direction is Buckhagen Wood, and about the same distance southward of the entrance the high, steep shore near Schönhagen is also a landmark.

Anchorage.—Good anchorage may be obtained off Schleimünde, in depths of from 5 to 8 fathoms, with westerly winds, but the anchorage is not recommended with those from the eastward.

Piers.—The river entrance is sheltered by two piers, the northern 886 feet, and the southern 394 feet in length, the entrance between

their heads being the 394 feet, but the channel is contracted by large rocks, extending from both pierheads.

Light.—On the north pierhead a light gray circular tower, 47 feet in height, exhibits at an elevation of 48 feet above high water an occulting white light, visible 12 miles.

Schlei River—Leading lights.—Four pairs of orange-colored leading lights have been established to lead through the various reaches of the river from Schleimünde to Kappeln. They are shown from white masts.

When proceeding up the river to Schleimünde lights should be kept in line astern, and the remaining leading lights in line ahead. The least depth on the leading line is 12½ feet.

Signal station.—A State signal station will communicate with vessels by the International Code.

Buoy.—A white spar fairway buoy, surmounted by two triangles pointing away from each other, and with "Schleisand O" in white letters, is moored about 2 miles eastward of the piers.

Entrance—Depths.—The Seegatt is a dredged channel with variable depths, but usually about 14 feet, which leads to the entrance of the Schlei, the depth in the latter being somewhat similar, but with a continuance of gales from between northeast and east-northeast the level of the water is raised about 6 feet, being lowered 5 feet by those from west-southwest, and the lowest level occurs frequently during the year.

In the river the channels vary considerably, both in width and in depth, in the former case alternating between narrow channels and open spaces of water; in some parts are depths of from 7 to 8 fathoms, but the dredged channels which occur in other parts are only from 50 to 60 yards in width, with depths of 12 feet at mean level.

Buoyage.—The entrance channel is marked by conical red buoys, surmounted by balls on the north, and by two conical black buoys on the south, and that of the river has red spar buoys or stakes on the starboard hand, surmounted by straw wisps, and conical black buoys or boughs of trees on the port side.

Wharf.—There is a wharf which will accommodate small vessels alongside.

Storm signals are shown from a mast standing southward of the pilot's dwelling. (Chapter I.)

Pilots for the entrance and for the river may be obtained and board vessels near the fairway buoy; should the weather be too rough for them to go out to vessels, the German flag, which the boats carry, is hoisted twice at the flagstaff on Lootsen Island and then hauled down.

Tugs.—The steamer plying between Kappeln and Kiel will tow vessels as far as the former place, and other small steamers on the river act as tugs.

Directions.—The pilot house, and the high steep shore near Schönhagen, can be seen in clear weather from a distance of 9 miles, and when the lighthouse becomes visible it should be brought in line with the south edge of Buckhagen Wood, bearing 286°, which will lead to the dredged entrance channel; afterwards the navigation is by the aid of the buoys.

Current.—The current generally sets in the direction of the channel, attaining a velocity of 3 knots, the ingoing stream being strongest with winds from northwestward and the outgoing stream with winds between southwest and west-southwest.

Ice.—In severe winters an ice barrier forms across the bar, preventing the entry or exit of steamers, although they may break through it partially. Within the river the passenger steamers keep it open as far as Lindaunis, assisted by the current, which is generally running until the frost is very severe.

Towns and villages.—On the left bank proper are the following places:

Maasholm, with about 500 inhabitants, 1½ miles within the entrance, is a post and telegraph station. Local pilots may be obtained here.

Kappeln, about 4 miles from the mouth, has about 3,000 inhabitants, and communication by steamer with Kiel, Schleswig, and Schleimünde, also by rail with Flensburg, Eckernförde, and Kiel.

A floating bridge across the river at Kappeln, the channel through it being 112 feet in breadth, and a telegraph cable is laid on both sides of the bridge. Below the bridge is a quay 886 feet in length, with a depth of 13 feet alongside, and above the bridge is a similar quay as regards length, but with 6½ feet alongside, and bricks, grain, and wood are exported.

Signals are made by black balls, one denoting that the bridge can not be opened; two, no passage for vessels from the south; and three, no passage for those from the north.

Storm signals are shown from a mast near Ellenberg. Chapter I.

Arnis, with a population of about 600 and 6 miles from the entrance, has regular steamship communication with Kappeln and Schleswig and by post and telegraph; the depth here is also 13 feet.

Lindaunis, a village with about 110 inhabitants, is nearly 11 miles from the entrance, and here the railway from Kiel to Flensburg crosses the Schlei over a swing bridge.

Schleswig, the capital of the province, has a population of about 18,000, and is a station on the railway connecting Altona, Neumun-

ster, Flensburg, and Wamdrup, and a narrow-gauge line connects it with Kappeln, Flensburg, etc.; it has also a steamer service to Kappeln.

The harbor, about 200 yards in length and with depths of from 9 to 13 feet, is situated on the south side of the town, and exports corn.

There is a hospital.

Coal and supplies.—About 100 tons of coal are kept in stock at Kappeln, 500 tons at Arnis, and about 450 tons at Schleswig. Water and some supplies may be obtained at these places. Small repairs might be executed.

Coast.—From Schleimünde the coast trends to the westward of south for 8½ miles to Böknis Eck, and then turns west-southwest, forming the north side of Eckernförder Bay.

Above Schleimünde it is flat, with partly wooded high land inland, but near Schönhagen it becomes higher, and between Schwansener See, 4 miles southward of Schleimünde, and Böknis Eck it is almost continuously wooded.

The most conspicuous marks are Kappeln Church and Schönhagen Castle, with Brodersby Mill west-northwest of it.

Depths offshore.—From abreast Schleimünde, where the shore bank is fully 1 mile offshore, within a depth of 3 fathoms, it gradually closes the coast, and as far as Böknis Eck is generally about ¼ mile off; within the 2-fathom contour line it is very foul with a number of large and small rocks and a quantity of seaweed.

A shoal composed of hard sand, with a depth of 2½ fathoms over and 5 fathoms round it, lies 1,400 yards offshore abreast of Schönhagen, and Schönhagener Ground, with 3½ fathom water over it, is more than 1 mile offshore eastward of the 2½-fathoms shoal and outside the 5-fathom contour line.

Buoy.—A conical white buoy, surmounted by a staff and a square, and with "Schönhagener Grund" on it, is moored eastward of that shoal.

Fishing stakes, in considerable numbers, are placed along this coast during the months of April to July, inclusive, and are in from 2 to 2¾ fathoms water.

Eckernförder Bay, entered between Böknis Eck, on the north, and Dänisch Nienhof on the south, 5¼ miles apart in a northwest and opposite direction, extends for a distance of 8½ miles in a west-southwest direction; the shores are high in places and generally wooded, more especially on the south side.

On the north side of the bay, about 2 miles southwest of Böknis Eck, is Klein Waabs Church, and west of it Ludwigsburger Wind Motor, which being the highest of the mills in the vicinity and having a smaller wind turbine northward of it, is easy of recogni-

tion. Farther westward the deviation beacons near Langholz, the measured mile beacons, and the monument on Der Ort, opposite Eckernförde, are all good marks.

At the head of the bay Eckernförde and Borby Churches and Windeby Holz are conspicuous, except that the slender tower of the former church is not always easily seen.

On the south shore are Krusendorf Church and Lindhöft mill, which latter stands high; the beacon near Dänisch Nienhof and two beacons near Lindhöft, may also be useful for fixing a position.

Light.—At the head of the bay, and about 1 mile southward of the town, is a yellow lighthouse consisting of a concrete structure 56 feet in height, on a stone base, which exhibits, at an elevation of 99 feet above high water, a fixed, occulting, and group flashing light, with white and red sectors, visible 16 miles. (For bearings of sectors and duration of light and eclipse, see Light List.)

Depths offshore—North shore.—Between Böknis Eck and Langhöft, a distance of about 3 miles southwestward, the shore bank within the depth of 3 fathoms, is about 800 yards distant from the shore, the inner part of it being rocky; the 5-fathom contour line, which is about ¾ mile from Böknis Eck, closes the coast to ⅛ mile off Langhöft.

Along the north shore of the bay the shore bank is nowhere more than 300 yards distant from it; a detached patch, with a least depth of 2½ fathoms, lies about 700 yards eastward of Langhöft.

Buoys.—The southeast edge of the shore bank, southeast of Langhöft, is marked by a red spar buoy, with "Langhöft" on it in white letters.

A black mooring buoy marked "Carmen" is moored on the north side of the bay abreast the outlet of Hemmelmarker Sea.

A red can buoy, surmounted by a staff and ball, marks the edge of the shore bank about half a mile eastward of Der Ort.

South shore.—The shore bank on the south shore is generally about 400 yards off it, the 3-fathom and 5-fathom contour lines being almost together, but northward of Dänisch Nienhof a bank, with depths under 5 fathoms, extends for nearly 1,600 yards.

Buoys.—A red spar buoy, surmounted by two red flags, and with "Stollergrund Rinne A" in white letters on it, marks the extreme of the bank northward of Dänisch Nienhof.

About midway between Dänisch Nienhof and Kronsort, a black can buoy (No. 1), surmounted by a staff and ball, marks the edge of the shore bank.

Stoller Ground, lying northeastward of Dänisch Nienhof, is described with the approach to Kiel Fiord.

Middle Ground, with a least depth of 3½ fathoms, over a bottom of sand and stones, is situated in the middle of the entrance to Eck-

ernförder Bay, and extends, within the 5-fathom contour lines, about 1¼ miles in an east and west direction, with a width of about 1,200 yards; on its northwest and south sides it is steep-to.

Buoys.—Middle Ground is marked by three buoys:

The northwest buoy is conical, black, with "Mittelgrund" in white letters on it.

The southwest buoy, black and red, in vertical stripes, is surmounted by a staff and cross, and has 'Mittelgrund B" on it.

The east buoy, similarly painted to the preceding, but having no top mark, is marked "Mittelgrund A."

Eckernförde Harbor consists of an outer and an inner basin, separated from each other by a small gangway bridge, which has an opening 33 feet in width, and from Windeby Noor by a double dam.

The depths in the outer harbor are from 2½ to 3 fathoms, and in the inner harbor from 1 fathom to 2¾ fathoms, but northeast winds raise the water about 3 feet, and those from southwest lower it 4 feet, such changes in level occurring frequently during the year. A quay, on the town side, is 1,312 feet in length, and has a depth of 2¾ fathoms at its outer part.

Light.—From a cylindrical gray iron tower, 43 feet in height, and situated on the harbor mole, a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 37 feet above high water, and is visible 10 miles. (For sectors, see Light List.)

Buoy.—A black and white horizontally striped fairway buoy lies in Eckernförde Roadstead.

Directions.—To enter the harbor by night, approach with the harbor light showing green and bearing 296° until Eckernförde Light shows white, bearing 180°, when a course of 292° must be steered until the harbor light bears 270°, when a course should be steered to pass it 300 yards distant.

Measured mile—Beacons.—Three pairs of beacons to indicate a measured distance of 2 miles are situated, respectively, on Boknis Eck, a ¼ mile southward of Ritenrade, and ½ mile eastward of Langhöft. The front beacons have each a triangular topmark, and the rear ones a square topmark.

The beacon on Der Ort has been removed.

The course for running over the measured distance is marked by three buoys, the middle one is a red conical buoy, the other two are red beacon buoys, and also by "Langhöft" Buoy, which is on the same line of bearing.

Deviation beacons.—Several beacons are placed on the shores of Eckernförder Bay, for the use of vessels, to ascertain the deviation of the compass.

Near Langholz, on the north side of the bay, are three beacons, which, used in line with a central beacon placed behind them, give 33° 40′, 303° 40′, and 348° 40′ bearings.

East and west beacons, situated about ⅓ mile southward of the town, are white, and in line bearing 259° 10′.

A black and white horizontally striped can buoy is moored in a depth of 11½ fathoms, ¾ mile off shore, on the line of the beacons.

On the south side of the bay, about 3¼ miles westward of Dänisch Nienhof, are 16 beacons, each of which can be used with Krusendorf Church tower.

The true bearings of the several beacons when in line with the tower are:

157° 25′ 42″, 155° 36′ 30″, 153° 37′ 24″, 151° 34′ 00″, 149° 32′ 54″, 147° 27′ 06″, 145° 23′ 30″, 143° 35′ 30″, 141° 18′ 00″, 139° 22′ 00″, 137° 24′ 30″, 135° 27′ 18″, 133° 19′ 48″, 131° 10′ 24″, 129° 15′ 00″, 127° 18′ 30″.

Storm signals are shown from a signal mast on the quay, about 60 yards southward of the entrance to the harbor.

Anchorage for large vessels may be obtained in the roadstead, in depths of from 10 to 11½ fathoms, over a bottom of oaze mixed with clay, with Eckernförde Church bearing between northwest by west and west-northwest, distant from 1 mile to 1½ miles.

Small vessels will find anchorage in from 5½ to 6½ fathoms water, in the small bight between Der Ort and the town, with the high land near Dänisch Nienhof over Der Ort, bearing about 86°.

Fishery.—Extensive herring and mackeral fisheries are carried out during the months of July, August, and September in the southern part of the bay westward of Aschan. The drift nets are anchored at one end and marked by floats.

Pilots may be obtained, but their employment is not compulsory; the boats fly the German flag, and they can take vessels as far as Schleimünde and Läbo.

Directions.—Large vessels are recommended to enter the bay northward of Stoller Ground and Middle Ground, steering west for Klein Waabs Church or Ludwigsburger Wind Motor, which is near it, until Bülk Spitze Lighthouse bears 159°, when alter course to 240° for Eckernförde Lighthouse buildings. If intending to pass southward of Stoller Ground and Middle Ground, and having passed Bulk Lightvessel and the red spar buoy ("Stollergrund Rinne C"), steer 303°, passing northeast of the red spar buoy ("Stollergrund Rinne B") until the beacon westward of Dänisch Nienhof bears 314°.

From this a 269° course should be steered, leaving Stoller Ground conical black buoys (2 and 1), on the starboard, and the red spar buoy ("Stoller Ground Rinne A") on the port hand, and when the lighthouse buildings bear 252°, and the beacon west of Dänisch Nienhof is about 153°, steer 252°, and to the anchorage selected.

By night.—The fixed white sector of Eckernförde Light, between the bearings 239° and 242°, with the single flashing white light on the north, and the double flashing white light on the south of it, leads northward of Stoller Ground and Middle Ground, and to the head of the bay, and when Eckernförde Harbor light shows red, the anchorage may be steered for.

Caution.—The southern fixed white sector of Eckernförde Light, between 250° and 254°, leads over Stoller Ground, and the lightbuoy, on the east side of that ground, which shows an occulting white light, is a warning to vessels against using the southern sector coming from seaward.

Ice.—Eckernförde Bay freezes more readily than Kiel Fiord or the sea in the vicinity, and the ice is seldom broken by steamers; with offshore winds the ice is soon driven out.

Customs cruiser.—A customs cruiser may be met with at sea, between Böknis Eck and Hohwacht Bay, or may be lying at anchor under the coast.

Town.—Eckernförde town, situated on the northwest side of the head of the bay, has a population of about 6,700, and railway communication with Kiel, Flensburg, and Kappeln.

Coal and supplies.—About 1,800 tons of coal are kept in stock, and fresh provisions and water can be procured.

Repairs.—Small repairs to vessels and machinery could be effected.

Trade.—The principal exports are grain and firewood, and imports coal, building wood, fodder, and manures.

Stoller Ground, lying northeastward of Dänisch Wohld, the land separating Eckernförder Bay and Kiel Fiord, extends for about 4⅓ miles in an east and west direction, within the 5-fathoms contour line, and has a greatest breadth of 2⅓ miles; the least water, 2¾ fathoms, is on a small patch a little more than 1 mile from its western end.

The bottom is foul and stony and somewhat uneven, as in places rocks stand up about 3 feet from the bottom.

Buoys.—Stoller Ground is marked by three buoys:

The north buoy, white can, is surmounted by a staff and two triangles pointing upward, and with "Stollergrund N" in white letters on it.

The southeast buoy is similar to the above, but the triangles point downward, and it is marked "Stollergrund S."

The west buoy is similar to the north and southeast, but the triangles point toward each other, and it has "Stollergrund W" in white letters on it.

Fairway Buoy.—A red spar lightbuoy, with "Kiel" in white letters on it, and exhibiting an occulting white light, with a period of

12 seconds; showing light, 8 seconds; eclipse, 4 seconds; is moored nearly 1 mile eastward of the east end of Stoller Ground, and is the fairway buoy for Kiel Fiord.

Stoller Ground Channel, the narrow channel, with depths of from 5¾ to 12 fathoms, separating Stoller Ground from the shore bank between Dänisch Nienhof and Bülk Point, is at its narrowest part about ¼ mile in width, between the 5-fathoms contour lines.

On the south side of the channel the shore bank, within a depth of 3 fathoms, extends nearly 1 mile in places from the coast between Dänisch Nienhof and Bülk Point, and the 5-fathoms contour line is about 1¾ miles off.

Buoys.—Three conical black buoys, numbered 1, 2, and 3, from west to east, and with "Stollergrund rinne" on them, mark the north side of this channel.

The edge of the 5-fathom contour line, on the south side of Stoller Ground Channel, is marked by three red spar buoys, the western of which, surmounted by a staff and two red flags and with "Stollergrund rinne A" on it is north of Dänisch Nienhof, and has already been mentioned.

The middle buoy, surmounted by a staff and a white ball, is lettered "Stollergrund rinne B," while the third and easternmost, with "Stollergrund rinne C" on it, has a white flag as a top mark.

Gabels Flat, about 2¼ miles in an east and west direction, and a little more than 1 mile in breadth, with a least depth of 5 fathoms, is situated about 8 miles eastward of Dänisch Nienhof.

Lightvessel.—Gabels Flat Lightvessel, lying 8 miles, 64°, from Bülk Point, has a red hull, with "Gabels flach" in white letters on the sides, two masts, and carries a black ball on mainmast.

It exhibits, at an elevation of 36 feet above the level of the sea, a group flashing white light visible 11 miles.

Fog signal.—A fog siren gives two blasts, high, low, every minute, thus: High blast, 2 seconds; silence, 2 seconds; low blast, 2 seconds; silence, 54 seconds.

In the event of the siren being out of order, two explosive reports with an interval of 30 seconds between them will be fired every 5 minutes, and a bell will be sounded every 40 seconds, thus: A group of 10 strokes, separated by short pauses, followed by a group of 3 strokes, separated by long pauses.

If a vessel is seen to be standing into danger two guns will be fired every three minutes; the bell will also be sounded and flag signals of the International Code hoisted.

Submarine fogbell.—A submarine fogbell is sounded from the lightvessel every 34 seconds, thus: Group of four strokes, 9 seconds; silence, 8 seconds; group of five strikes, 12 seconds; silence, 5 seconds; the interval between the strokes is 3 seconds. (See Chapter I.)

Signals.—The lightvessel is fitted with Morse apparatus for night signals, and vessels can communicate by night.

Current signals.—Signals indicating the direction and velocity of the current are made from dawn to dusk from Gabels Flat Lightvessel, the direction being denoted by shapes and the velocity by black flags and pennants.

The mean direction of the upper strata of water and the mean of the velocity at the surface and at a depth of 18 feet are given. (See Chapter I.)

Buoys.—Gabels Flat is marked by two white spar buoys:

The eastern, surmounted by two triangles pointing away from each other, has "Gabels flach O" in white letters on it.

The west buoy is similar to the eastern, but has two triangles pointing toward each other, and "Gabels flach W" in white letters on it.

Kiel Fiord extends about 9 miles in a south by west direction from Bülk Point, and on the western side of the entrance is moderately high and little wooded, and within the fiord land is of the same description, but is wooded in places.

Conspicuous landmarks on the west side are Bülk and Friedrichsort Lighthouses; Dänischenhagen Church, Sprenge, and Kaltenhof Mills, the latter having five wings, Friedrichsort Barracks, Dankes Church at Holtenau, the water tower at Revensberg, and Nicolaus and the Garrison Church towers at Kiel.

On the east side are Probsteierhagen Church, the view tower at Schrevenhorn, and Gaarden Church.

Bülk Point, on the western side of the entrance to Kiel Fiord, is a low rounded projection extending in an east-northeast direction from the coast.

Light.—On Bülk Point is a white cylindrical tower, 89 feet in height, with a red band, and having a brown dome; it exhibits, at an elevation of 98 feet above water, a flashing white light and a group flashing white light. The light is visible 15 miles. For period see Light List.

Fog signal.—A siren, situated in front of the lighthouse, and at an elevation of 31 feet above high water, sounds for 5 seconds, at intervals of 40 seconds, but it is not used when Bülk Lightvessel is in position.

Signal station.—Bülk Point is a State signal station, and vessels can communicate with the lighthouse by the International Code; the lighthouse is in telephonic communication with Kiel through Friedrichsort. Ice information is given.

Storm signals are shown. (See Chapter I.)

Radio telegraph.—Bülk Point is a radio telegraph station under the control of the German naval authorities, but is open always for public use for all systems; the call letters are KBK, and it has a range of about 120 miles.

Lightvessel.—A lightvessel having two masts, carrying a black ball, 74 feet in height, and with a red hull and "Bülk" in white letters on each side, is moored 2 miles eastward of Bülk Point Lighthouse, and exhibits, at an elevation of 36 feet above sea level, a flashing red light with a period of 8 seconds, showing a flash for 2½ seconds; the light should be visible, in clear weather, from a distance of 11 miles.

The light vessel is occasionally withdrawn for a short period during gun practice.

Fog signal.—A horn gives a blast of three seconds' duration, followed by silence of 17 seconds.

Should the horn be out of order a gun will be fired twice every 5 minutes, the interval between the reports being 30 seconds, and a bell will be sounded 10 times in succession every 30 seconds.

Vessels seen standing into danger are warned by signal (International Code), also by a double report and ringing of the bell.

Signals.—The vessel is fitted with Morse apparatus for night signals.

Kleverberg, extending nearly 1,800 yards eastward of Bülk Point, has foul ground consisting of rocks and bowlders which rise about 3 feet from the bottom in places; it has some patches of 1 fathom, otherwise the depths are from 2 to 2¾ fathoms.

The bank extends about ⅔ mile southeast of the point and from that gradually closes the shore to Strander, in Strander Bight.

Buoys.—The east edge of the 5-fathom contour line, eastward of Bülk Point, is marked by a red spar buoy, surmounted by a staff and diamond with "Kiel A" in white letters on it.

Within this buoy, and half a mile northeast by east of Bülk Point, is a red can buoy, surmounted by a ball, and with "Kiel A1" on it.

On the southeast side of Kleverberg is a red spar buoy, surmounted by a staff and letter B and with "Kiel B" on it.

Strander Bight.—From Bülk Point the coast trends to the southwestward for about 1½ miles and turns to the south-southeastward, forming Strander Bight, which recedes about 1 mile. From the south side of this bight the coast has a southerly direction, for about 1½ miles, to Friedrichsort.

Light.—A fixed white light is exhibited from a black tower, 53 feet in height, on the pier of the torpedo range, at an elevation of 63 feet above high water, and is visible 5 miles.

The entrance to the boat harbor is marked by a fixed red light on the west side and a fixed green light on the east side.

Mooring buoys.—The positions of several mooring buoys in Strander Bight will be seen on the chart; a number of small buoys moored northeast by east of the pier are for securing targets to.

Anchorage is prohibited between the north shore of the bight

and a line joining the torpedo pier and buoy "Kiel No. 4" when torpedo practice is being carried out. The hours for practice are given below.

Strander Grasberg, extending for nearly 1 mile in a northeast direction from the south side of the bight, in a tongue of shoal, is similarly composed to Kleverberg. Farther south, on the west side of Kiel Fiord, the shore bank, except off Wiker Bight, where it extends nearly 800 yards, is narrow.

Buoys.—The northeast extreme of Strander Grasberg is marked by a red spar buoy, surmounted by a staff and letter C. It has "Kiel C" in white letters on it.

The east side of the southern part of Strander Grasberg has a red spar buoy, surmounted by a staff and letter D on it, with "Kiel D" in white letters.

Beacons.—Two beacons, painted red and white, stand on the shore of the bight, and there is also a beacon for correcting compasses.

East side.—The eastern entrance point of Kiel Fiord is the coast about Labö, and eastward of this the land is flat. Stein Village is about 2 miles eastward of Labö, and here a dike commences, which protects the meadows against floods, stretching as far as Rethkuhle.

The only conspicuous marks on this part of the coast are the lock keeper's house at the entrance to Barsbeker See; Heidkale, a shepherd's solitary house, surrounded by bushes, its straw-thatched roof being only visible over the dike; Kalifornien, two huts at the meadow dike, belonging to fishermen; Schönberg Beacon and Church, with the houses of that town; and Krokan Mill, about 1 mile northwest of it.

Schönberg Beacon, standing on the shore 2 miles northward of Schönberg Church, is 90 feet high, and painted black and white horizontally, and at a height of 67 feet is fitted with a reflector apparatus, the middle surface of which points in an 86° direction.

A searchlight, or other powerful light source, thrown on the reflector, causes a reflected light to appear to an observer situated in the vicinity of the light source, the field of vision embracing an angle of about 34° on each side of the direction given.

Kolberger Heide.—The shore bank off the north part of this coast extends northward for 1½ miles, within the depth of 5 fathoms, the inner part, with depths under 3 fathoms, named Kolberger Heide, extending about ¾ mile; it is foul in a similar manner to Kleverberg.

A shoal with 2¼ fathoms least water and 800 yards in extent lies 1,200 yards south of bellbuoy "Kiel 1," northward of Kolberger Heide.

Spoil ground.—The area between the 3-fathom and 5-fathom contour lines off Kolberger Heide is used as a spoil ground, and the

amount of dredged matter deposited has been so great that the depths are reported as 2 fathoms less than shown on the chart.

The depth over a portion of the spoil ground northward of Kolberger Heide is from 2 to 2¼ fathoms. A new spoil ground, triangular in shape, is situated in the bight of deep water northeastward of Kolberger Heide.

Buoys.—The oil spoil ground is now marked by a green conical buoy with staff and ball (No. 1), situated on the southern side of the shoal patch mentioned above, and on its eastern side by the lightbuoy (No. 1) with orange-colored light, which also marks the west corner of the new spoil ground; this new spoil ground is further marked by a green spar buoy, marked "1," with upturned broom, in the middle of its southwest side; by a lightbuoy similar to the above-mentioned lightbuoy, but marked "2," at its south corner; and by a green spar buoy, with two upturned brooms, marked "2," at its east corner.

Whistlebuoy.—A conical black whistlebuoy is moored about 2¼ miles north by east of Schönberg Beacon.

Bellbuoy.—A black bellbuoy, with "Kiel 1" in white letters on it, and having a white circular top mark, is moored 3 miles northwestward of Schönberg Beacon.

Buoys.—On the northwest and west-northwest side of the 5-fathom contour line inclosing Kolberger Heide are conical black buoys, the northeastern numbered "Kiel 2" and the southwestern "Kiel 3."

Au Hook, the inner part of the shore bank, eastward of Labö, is stony, foul ground, and extends about ¾ mile northward, within the 3-fathom contour line.

Buoy.—The northwest side of Au Hook is marked by a conical black buoy, with "Kiel 4" in white letters on it.

Labö Sand extends about 700 yards northwest of the coast northeastward of Labö, the depths being under 1 fathom.

Light and bellbuoy.—The west side of Labö Sand is marked by a conical black bellbuoy, surmounted by a staff and ball, and with "Kiel 5" in white on it, which exhibits a group flashing white light, showing groups of two flashes.

Labö Harbor, on the south side of Labö Sand, is formed by two stone breakwaters, extending about 300 feet southwest and 500 feet north-northwest, with an entrance 82 feet in width between their heads; the depth in the harbor and at the wharves is 13 feet.

Light.—An unwatched fixed red electric light is exhibited, at an elevation of 11 feet above high water, from a pole 9 feet in height, on the north breakwater head, and is visible 3 miles.

Customs guardship.—The customs guardship, lying at the southwest breakwater, is a black fore and aft schooner, flying the customs flag by day, and by night exhibiting a fixed red light over a fixed

tively; the lights are visible 1 mile.

Life-saving station.—Labö has a lifeboat and a rocket apparatus.

Storm signals are shown from a staff which is on the seawall near the bathing pavilion. (See Chapter I.)

Madsens Sand.—From Labö, the east side of the fiord trends southwestward for 1⅔ miles, to Möltenort, the east entrance point to Kiel Harbor, and from the shore southwest of Labö as far as Batterie Eck, the steep-to shore bank, known as Madsens Sand, extends for nearly ¼ mile within the 3-fathom contour line, the 5-fathom contour being close outside it; between Batterie Eck and Möltenort the shore bank is about 200 yards in breadth.

Beacon.—At Jägersberg, close to Batterie Eck, there is a wooden beacon, 49 feet high, and surmounted by two rectangular top marks; it is for the use of vessels running the measured mile. A similar beacon is situated near Forsteck, southward of Wiker Bight.

Lightbuoy.—A conical black buoy, with "Kiel 6" in white letters on it and exhibiting a group occulting red light, is moored about 400 yards west by north of Batterie Eck.

Kiel Harbor is that portion of the fiord southwestward and southward of an imaginary line joining Friedrichsort Lighthouse and the western measured mile beacon on Möltenort, the naval port being an area northeastward of a line from a beacon southward of Barbarossa Pier, southeastward for about 300 yards, and south-southwest for a similar distance, to the dry docks; the commercial port is southwestward of this line. Die Hörn is the narrow part at the head of the harbor. The northern limit of the Imperial Naval Hafen of Kiel is defined by the parallel of 54° 28′ north, between the boundary stone on Bülk Point and the meridian of 10° 20′ east, thence by this meridian to the boundary stone on the shore southward of Kölberger Heide.

Leading lights.—Two leading lights, to lead through the fiord, from abreast of Friedrichsort Lighthouse to abreast of Lightbuoy Kiel 8, have been established at Batterie Eck.

The front light, occulting green every four seconds, elevated 52 feet, and visible 7 miles between the bearings of 35° and 44°, is shown from an iron framework tower, 50 feet in height, situated on the shore close northward of Jägersberg Jetty.

The rear light, fixed green, elevated 73 feet, and visible 11 miles between the bearings of 35° and 54°, is shown from an iron framework tower, 38 feet in height, situated 212 yards 40° from the front light.

West side.—Friedrichsort is a fortress forming the western entrance point to the harbor, and on its south side is a saluting battery

and a torpedo station. A number of small buoys for mooring targets are placed southwest of the pier.

From the point of Friedrichsort a spit of sand extends eastward for about 200 yards, beyond which the shore bank, with depths under 1 fathom, extends a similar distance in the same direction. The shore bank southward of Friedrichsort is only about 100 yards off.

Light.—On the eastern edge of the shore bank is a red cylindrical tower, 40 feet in height, with two white bands, which exhibits at an elevation of 44 feet above high water a fixed and group flashing white light, visible 10 miles.

A red sector, visible between the bearings of 300° and 320°, has been inserted in the light. This red sector indicates to vessels outward bound when they should have the line of Batterie Eck Lights, and alter course to the northward. (For sectors, see Light List.)

Fog signal.—A foghorn, worked by compressed air, gives three blasts every 30 seconds, thus: Blast, 2 seconds; silence, 2 seconds; blast, 2 seconds; silence, 2 seconds; blast, 2 seconds; silence, 20 seconds.

If the horn should be out of order, a bell is struck five times in quick succession every 40 seconds, thus: Stroke; silence, 3 seconds; stroke; silence, 3 seconds; stroke; silence, 3 seconds; stroke; silence, 3 seconds; stroke; silence, 24 seconds.

Storm signals are shown both by night as well as by day from a flagstaff on the wall of the fortress, opposite the lighthouse, a red lantern being used for night signals. (See Chapter I.)

Ice information is given.

Boat harbor.—A boat harbor, with depths of from 1¾ to 2¼ fathoms, is situated about ½ mile westward of the point, and between are several piers; fixed red and green lights are shown from the sides of the entrance to the boat harbor, and various white, red, and green lights are exhibited on the piers.

Sticken Hörn, a bay westward of the boat harbor, is filled with shore bank, extending within a depth of 3 fathoms, for 600 yards, the 5-fathoms contour line being 900 yards offshore; from this bay the east side of the harbor trends southwestward to Holtenau and the north entrance point to Kaiser Wilhelm Canal.

For Kaiser Wilhelm Canal, see below.

Mooring Buoys.—Several mooring buoys have been established off Sticken Hörn, southward of the boat harbor.

Quarantine Pier—Beacons.—Vossbrok is situated southward of Sticken Hörn, and the quarantine hospital, which has 24 beds, is in Vossbrok Wood; the pier for the hospital is about ½ mile northeastward of the entrance to the canal and has a depth of nearly 15 feet at its extreme.

Coaling harbor.—About ¼ mile southward of the canal entrance is that to a coaling harbor, which is 700 feet in length, 130 feet in width, with a depth of 21 feet; the coal wharf is on the west side of the harbor.

Wiker Bight, about ¾ mile south-southwest of the canal entrance, is also filled with shore bank, the 3-fathoms and 5-fathoms contour lines being respectively 600 and 800 yards off-shore; a torpedo-boat harbor in the north side of Wiker Bight is formed by a breakwater, extending 700 yards in a southerly direction.

Lights.—Two fixed green electric lights, placed vertically, are shown at elevations of 39 and 36 feet above high water from gray iron supports 30 feet in height, situated on the end of the breakwater, and are visible 3 miles.

A fixed red light is shown on a dolphin westward of the breakwater head, and two white fixed lights, placed vertically, at its inner end.

Fog signal.—A bell at the outer end of the breakwater of the torpedo-boat harbor, gives a group of 3 double strokes about every 20 seconds.

Düsternbrook Light.—A group flashing white light is exhibited at an elevation of 34 feet above high water from the head of the new pier and is visible 2 miles.

Fog signal.—A siren gives one blast of 15 seconds' duration every 45 seconds.

Piers.—Between the south side of Wiker Bight and Kiel Town a number of piers extend from the shore, the most important having lights. The principal of these piers, with the lights shown are: Iltis, two fixed white; Iltis Jetty, two fixed white; Bellevue, one fixed white and one fixed green; Düsternbrook yacht harbor, two fixed white on each side of the entrance; naval boat harbor, four fixed white; Reventlou Jetty, two fixed green at the north, and the same at the south end; Seeburg Jetty, one fixed white; Elizabeth Jetty, two fixed white; Hansa Jetty, one fixed white; Gefion Jetty, two fixed white; Barbarossa Jetty, two fixed white; Castle Jetty, fixed red, white, and green; Seegarten Jetties, fixed white and red.

Southwest of the latter and opposite Gaarden are the mail-steamer wharves.

East side.—Möltenort, the eastern entrance point to the harbor, has three measured mile beacons standing on it, and on the southwest side of the point is a jetty.

Lightbuoy.—A lightbuoy painted black and marked "Kiel 6a," exhibiting a group flashing white light every 12 seconds, 4 flashes in each group, is moored on the northern side of Möltenort.

Heikendorf.—From Möltenort the east side of the harbor trends southward for about ¾ mile and then southwest by west for the same distance to Kitzeberg, forming a bay, at the head of which is Heikendorf Village and a landing stage.

Torotter Berg, the shore bank extending westward of Torott, a small hill 49 feet high on the north side of the bay, has depths under 3 fathoms at about 300 yards, and the 5-fathom contour line is the same distance outside this.

Buoy.—A conical black buoy, with "Kiel 7" on it is moored westward of Torotter Berg.

Kitzeberg, the southwest point of the above bay, has a flagstaff on it.

Light.—An unwatched fixed red light is shown at an elevation of 24 feet above high water from a yellow iron beacon 33 feet in height and visible 4 miles.

Shore bank.—The shore bank from Torotter Berg, round the bay and to the northward of Kitzeberg, extends within a depth of 3 fathoms to about 300 yards from the shore, the inner part having rocks on it.

Lightbuoy.—A conical black lightbuoy, marked "Kiel 8" in white letters and exhibiting a group occulting white light with groups of two occulations, is moored about 350 yards northward of Kitzeberg.

Schwentine River is about 1⅝ miles southward of Kitzeberg, and on the north side of its entrance is a large shipbuilding yard with another eastward of it; between Kitzeberg and Schwentine River there are also other building yards.

The shore bank is narrow between these points, being scarcely one cable at its broadest part, until about ½ mile northward of the entrance to the river, where its breadth is increased to about 300 yards.

Buoys.—Three conical black buoys, each surmounted by a staff and ball, and marked, respectively, 9, 10, and 11, are moored off this shore, near Hölzenberge; they are for use in connection with compass adjustment.

Lightbuoys.—A lightbuoy, painted black and marked "Kiel 12," exhibiting a group occulting red light, two eclipses in each group, is moored off the spit westward of Dorfstätte.

A similar lightbuoy, but marked "Kiel 13," exhibiting a group occulting white light, two eclipses in each group, is moored on the northern side of the entrance to Schwentine River.

Buoys Kiel 9 and Kiel 10 are unlighted conical buoys, and are situated off the spit northward of Mönkeberger Strand.

Basin.—Southward of the entrance to Schwentine River is a basin about 800 yards in length, 300 yards in width, and 34 feet in

3 fathoms, extends nearly 400 yards along the south bank of the river; the depths in the channel of the river northward of it are from 3¼ to 5 fathoms.

Lights.—At the end of new pier projecting from north side of the breakwater of the new basin a fixed white light is exhibited, at an elevation of 13 feet above high water, from a wooden post, 8 feet in height, and is visible 2 miles.

At the head of the new breakwater a fixed white light with red sectors is exhibited, at an elevation of 29 feet above high water, from a gray wooden post, 13 feet in height, and should be seen from 1 mile.

Dockyard.—The Imperial Dockyard, immediately to the southward of the basin above mentioned, has an equipment and construction basin, and a torpedo-boat harbor; the dimensions of the docks are as given in the following table:

Name of dock.	Length.		Breadth of entrance.	Depth at H. W. O. S.		Lifting power.	Date built.	Remarks.
	On blocks.	Over all.		On sill.	On blocks.			
Government dry docks:								
No. 1	388	411	71	28	27½	.....	1876	No. 1—405, 428, with caisson in outer stop.
No. 2	360	381	70½	25½	24½	.....	.....	No. 2—377, 398, with caisson in outer stop.
No. 3	340	363	64½	22½	21½	.....	.....	
No. 4	334	344	67	16½	15½	.....	.....	
No. 5	541	570	82	27½	.....	.....	.....	
No. 6	574	591	98	37	35	.....	.....	
Government floating dock	656	.....	141	39	35	40,000	.....	
Floating dock	.....	252	59	.....	.....	3,000	.....	
Do	.....	.....	.....	.....	.....	.....	.....	
Floating dock—Kiel Dockgesselschaft:								
Part 1	141	.....	[1] 45½	15	.....	700	.....	Two parts generally joined, but can be worked separately.
Part 2	59¾	.....	[1] 45½	15	.....	300	.....	
Floating dock—Schwentine Dockgesselschaft, No. 3	230	.....	66	25½	.....	4,570	.....	

[1] Extreme width.

Lights.—A group flashing red light every 10 seconds, showing two flashes in each group, elevated 7 feet, is exhibited from the northwest corner of the large floating dock situated at the southwest end of the dockyard.

At the entarnce to the equipment basin a fixed red light is exhibited on the northeast side, and on the southwest side a fixed green light. These lights are shown at an elevation of 32 feet above high water, from green standards 21 feet in height.

Four fixed white lights are also shown on each side of the entrance, at elevations of 28 feet above high water.

Leading lights.—Two unwatched fixed red leading lights, 160

yards apart, and in line bearing 215° are exhibited from gray iron beacons, 41 and 27 feet in height, respectively, on the western end of the dockyard, near the dry docks, and are visible 6 miles; the rear light is shown at an elevation of 52 and the front light at 35 feet above high water.

Two pairs of fixed green leading lights are shown at Kiel.

The commercial harbor, on the west side of Die Hörn, is about 1¼ miles in length, with depths of from 10 to 20 feet alongside the quays.

Measured mile.—A measured mile, for ascertaining the speed of vessels, is situated between the entrance to Kaiser Wilhelm Canal and Möltenort, the running line being with Labö Mill in line with a beacon near Jagersberg, bearing 39°, and on the same line there is a beacon on the west shore at the inner part of Forsteck Jetty. The northeast pair of beacons for the mile are on Möltenort, and the southwest pair are on the western shore, near Vossbrok Quarantine Pier.

Deviation beacons.—A number of beacons are situated on the shores of Kiel Fiord and Harbor for the use of vessels to ascertain the compass errors.

A beacon which stands on the inner shore of Strander Bight, when in line with Dänischenhagen Church Tower, bears 257°.

On the shore near Vossbrok are two beacons, giving a north and south magnetic line, a beacon near Monkeberg serving as a rear beacon for the same line.

For the east and west line the two beacons on Möltenort are used; the upper beacon, 30 feet high, is surmounted by a truncated cone, and the lower beacon, 87 feet high, has a rectangular top mark; they are in line 79° 24′ (true). A beacon northward of Holtenau serves as a mark to the westward.

The beacon system near Monkeberg, on the east side of the harbor, consists of a central beacon used in combination with several numbered beacons, and the magnetic bearings, in 1909, of the numbered beacons in line with the central beacon was as follows: The variation used for 1909 was 10° 58′ west:

Beacon number.	Magnetic bearing in line with central beacon.	Beacon number.	Magnetic bearing in line with central beacon.	Beacon number.	Magnetic bearing in line with central beacon.
58	57° 49′ 48″	69	68° 50′ 30″	106	106° 28′ 0″
59	58° 49′ 48″	70	69° 49′ 54″	110	110° 11′ 0″
60	59° 50′ 36″	71	70° 48′ 30″	112	112° 12′ 54″
61	60° 47′ 48″	72	71° 49′ 24″	114	114° 13′ 16″
62	61° 49′ 48″	73	72° 47′ 54″	116	116° 13′ 6″
63	62° 50′ 30″	74	73° 48′ 24″	118	118° 13′ 24″
64	63° 50′ 24″	75	74° 46′ 48″	120	120° 13′ 18″
65	64° 49′ 48″	98	98° 32′ 18″	122	122° 12′ 48″
66	65° 48′ 36″	100	100° 33′ 18″	124	124° 14′ 18″
67	66° 49′ 30″	102	102° 28′ 54″	126	126° 16′ 0″
68	67° 48′ 18″	101	101° 30′ 0″	128	128° 16′ 30″

Mooring buoys.—There are a large number of moorin
the harbor, the positions of which will be seen on the cha
these have telephonic communication with Düsternbrook
tion, the numbers of the buoys so connected being A4, A5, A
A10, A11, B1, B2, C2, and F.

In addition to mooring buoys a number of warping a
mooring buoys are in various parts of the harbor.

Entrance—Depths.—The breadth of the entrance betv
fathom contour lines, off Friedrichsort, and the shore n
Möltenort, is 800 yards, the depths being from 6½ to 9 fat
which the harbor opens out to a breadth of 1½ miles, abre
Wilhelm Canal, and in this part the depths are from 6 to 8

Southward of Wiker Bight the harbor again contracts
gable channel being only about 700 yards from the e
Schwentine River to the dockyard, and the depths genera
to 7 fathoms, except southward of Admirals Jetty, where
Hole, a deep spot, has 10 fathoms; southwest of the do
harbor gradually narrows to the breadth of 200 yards, and
decrease below 5 fathoms.

The level of the water is raised by winds from nort
northeast, to east, and lowered by winds between west
west; from 10 years' observations the highest level rea
feet, and the lowest 5 feet above and below mean sea lev
tively, and the level was from 3½ to 5 feet below mean on a
occasions during the year, and frequently below 2 feet.

With heavy gales, when the water rises abnormally high,
known as a storm flood, and these are to be expected w
northeast gales; on November 13, 1872, the water rose, dur
these floods, nearly 10½ feet.

Buoyage.—The buoyage is in accordance with the Ge
tem (see Chapter I). On the west side, within Friedrich
are no buoys, and those on the east side have been already
the descriptions of the various shoals which they mark.

Tugs.—Passenger steamers plying in the fiord underta
and if a tug should be required, the requisition should be
to the Neue Dampfer Kompagnie, as also in the event of
steamer being required.

Telegraph and telephone cables cross the fiord betw
richsort and Läbo, and in the harbor between the torpedo
and Dietrichsdorf, their positions being marked by telegra
and spherical green buoys, marked T. The telegraph
Korügen has a white ball top mark.

Pilots.—Four chief pilots are stationed at Labö, and o
and these take vessels from Bülk Point to Eckernförder H
genhafen, and Flensburger Fiord; a number of secondary

also at both places, and perform the duty in the absence of the head pilots.

Vessels approaching the fiord and showing the usual pilot signal are signaled from Bülk Point Lighthouse, or from Labö, and the pilots board them in rowing or sailing boats, carrying the pilot flag at the masthead.

Anchorages.—Vessels must anchor in accordance with the directions received from the captain of the port, and are not allowed to change the anchorage without permission; questions regarding anchorage may be asked by signal from the signal stations at Bülk Point, Friedrichsort, or Düsternbrook.

Holtenau anchorage is only to be used by vessels intending to enter or that have left Kaiser Wilhelm Canal.

The mooring buoys in the Imperial Naval Harbor are solely for the use of vessels belonging to the Imperial Navy, and vessels are not allowed to make fast to them without the permission of the captain of the port; this does not extend to the mooring buoys in the commercial harbor.

Anchorage is prohibited in the principal channels, and a vessel obliged through necessity to anchor southwestward of Friedrichsort should be at least 400 yards from the line on which torpedoes are run.

Quarantine anchorage.—Vessels in quarantine anchor in the vicinity of the quarantine establishment at Vossbrok, but not to the southward of the landing pier of that place.

Explosives anchorage.—The anchorage for vessels having explosives on board, and which should fly a black flag, is in the bay off the ballast jetty at Monkeberger Strand, and inside the line of obscuration to Kitzeberg Light.

Directions.—Approaching Kiel Fiord and harbor from the Little Belt, or from Flensburger Fiord, the moderately high land of Dänisch Wohld, the peninsula that separates Eckernförder Bay from Kiel Fiord, is unmistakable, with Bülk Lighthouse on its eastern side.

From the Great Belt or Fehmarn Sound, the first object sighted will probably be Gables Flat Lightvessel, from which a course should be shaped toward Bülk Lighthouse and Lightvessel, and when nearing the latter bring the Naval Church or Nicolaus Church in line with Friedrichsort Light Tower, bearing 208° or 206°, respectively.

A vessel will pass between "Gabels Flat O" buoy and Gabels Flat Lightvessel by keeping Schönberg Church in line with the beacon on the shore, bearing 181°.

With some atmospheric conditions, Bülk Point Lighthouse is not easily distinguished, but the lightvessel, if in position, should be a guide, and another good mark for entering the fiord, especially if coming from the eastward, is Kiel Water Tower in line with a gap

in the wood, near Friedrichsort, bearing 214°, which leads close westward of "Kiel 3" buoy.

Having passed eastward of Friedrichsort Lighthouse, Villa Seebliek, at the foot of Düsternbrook Wood, and just within Bellevue Pier, will be seen, and if brought in line with the tower of the Naval Church 210° it will lead clear of all dangers until inside Kitzeberg. When within the limits of the Imperial Naval Harbor vessels must keep on that side of the fairway which lies on the straboard hand.

By night.—From the northward Bülk Point Light may be approached, bearing about 219°, which leads southeastward of the northern fairway buoy (red spar, occulting white light), and into the fixed white sector of Friedrichsort Light; or Bülk Lightvessel may be steered for 201°, and when in the white sector of Friedrichsort Light it should be steered for between the bearings of 202° and 209°, which will lead to the entrance of the harbor after passing Bülk Lightvessel.

When Labö red light is seen, edge to the southward slightly to leave the fixed white sector of Friedrichsort Light, so as to pass clear eastward of it, the lightbuoy "Kiel 6" being a guide for the east side of the channel. When the fixed red sector shown from Friedrichsort Lighthouse is reached, the line of Batterieeck leading lights can be followed until abreast of light buoy "Kiel 8."

When within Kitzeberg, mid-channel of the harbor should be kept, passing between the eastern row of mooring buoys and lightbuoys "Kiel 12 and 13," and when abreast the latter the vessel should immediately keep more to the westward to bring the leading lights (fixed red) at the dry docks in line 215°, which leads between the mooring buoys.

When maneuvering in a vessel off the bay on the northwest side, between Friedrichsort and Voosbrook, the shoal water in it is cleared, except toward the southwest part, by keeping Friedrichsort Lighthouse and Labö Mill in line, bearing 58°; and on the southeast side the shoal water between Möltenort and Kitzeberg is cleared by not going eastward of the line of Möltenort outer measured mile beacon in one with Fort Stosch Flagstaff.

Speed limits.—The Imperial Harbor is divided into three zones for the purpose of regulating the speed of vessels: No. 1 zone extends from the south boundary of the Imperial Naval Harbor up to a line joining the north corner of the Yacht Harbor, at Düsternbrook, with Pier No. 2 of the ammunition depot at Dietrichsdorf.

No. 2 zone is from the last-mentioned line to the parellel of latitude, passing through Friedrichsort Lighthouse.

No. 3 zone extends from the last-mentioned line to the north boundary of the Imperial Naval Harbor.

In zone No. 1 the speed is not to exceed 7 knots for vessels over 56 feet in length, and 9 knots for torpedo boats. In zone No. 2 the maximum speeds, respectively, for the vessels named, is 10 knots and 12 knots; and in zone No. 3, 12 knots and 15 knots.

Herring fishery.—From September to May, inclusive, herring fishery is in progress in Kiel Fiord.

The outer end of the nets used for the fishing are marked by perches with red flags by day, and by small lightbuoys at night, and the nets are drawn toward the nearest shore.

When these marks are seen on the eastern side of Kiel Fiord, vessels must pass westward of them; and when observed on the western side of the fiord, vessels must pass eastward of them.

Current.—The current, which is not considerable, depends chiefly on the wind, and runs after the water is either pressed in or out of the Baltic, through the Belts and the Sound.

Ice.—As long as Kiel Bay is not blocked by ice the channel is kept open by the numerous passenger steamers, but with northeast gales the ice dams up off the fiord, and in the narrows outside forming a bar at Friedrichsort, which, if frozen together in severe winters, becomes impassable; owing to the current from Schwentine River, the portion of the harbor near its mouth is free from ice longer than other parts. With southwest winds the ice drives seaward easily.

In 55 winters (1850–51 to 1904–5) the port was closed on an average 12.8 days per year, and was free from ice during 34 of these winters.

In 1891 navigation was stopped between January 5 and February 3 by an ice barrier 10 feet thick, which formed across from Brauner Berg to Jägersberg, and a channel had to be made by blasting. For a period of 17 years (1875–1891) the fiord was blocked by ice on an average of nine days yearly. (See Average ice conditions, Appendix.)

Harbor regulations.—The regulations for Kiel Harbor, referring to various classes of vessels, and embracing a number of subjects, are somewhat numerous, so that only the principal will be mentioned here, as presumably each vessel visiting the harbor will have no difficulty in obtaining copies of the necessary rules for their guidance.

All vessels navigating within the limits of the Imperial Naval Harbor of Kiel must give way to ships of war, which summon them to do so by means of one long blast of at least 5 seconds' duration on the siren or steam whistle.

A vessel having the Kaiser or Kaiserin on board hoists the Standard or Imperial broad pennant both by day and by night, and if in a steam vessel carries by night four white lights, placed vertically,

under the steam light, and as the distances which they are apart depends on the size of the vessel in some cases they may appear as one continuous streak of light.

A white light is also carried at two mastheads, if the vessel has that number of masts.

A vessel carrying the above signals must be avoided as much as possible, and if the width of the channel permits, should not be passed within a distance of 200 yards.

It is not permitted to approach a vessel at anchor which exhibits signals showing the presence of the Kaiser or Kaiserin on board, unless under necessary circumstances, and then it is not allowed to remain in the vicinity longer than absolutely required.

If, during the stay of the Kaiser, a red flag is shown by day or a lantern waved by night on the Academic or the Hertha Pier, the entrance to the boat harbor between these piers is closed, and all vessels passing should do so at not a less distance than 50 yards, to allow a clear passage for any boat which may contain His Majesty.

The police vessels in Kiel Harbor carry a yellow flag at the bow, and by night, in addition to side lights, display a red over a white light.

Vessels of war, as well as merchant vessels, must conform to all instruction they may receive from the police.

No ashes, sand, stones, or refuse of any description may be thrown overboard in the harbor, but must be discharged into vessels provided for the purpose.

No vessel is permitted to make fast to any beacon or buoy used for the purposes of navigation.

The naval piers are only intended for the purposes of the German Navy, and unauthorized use of them is forbidden.

Steam vessels intending to pass the torpedo-boat harbors must give a long blast of from four to six seconds duration on the whistle or siren before doing so.

Gunnery practice.—During the summer months practice in gunnery takes place by day between 6h. 30m. a. m. and 3h. p. m., and by night from 8h. p. m. and 2h. a. m., within the following limits:

West.—A line in a 359° direction from Bülk Lighthouse, and the coast between that lighthouse and Friedrichsort.

North.—The parallel of 54° 45′ north.

East.—A line in a 359° direction from Schönberg Church.

South.—A line in a 146° direction from Friedrichsort Lighthouse to Korugen Jetty.

The area within the above limits is closed to all vessels, except German and Danish mail steamers flying the mail flag, during the time that a red double pennant is hoisted at the top of the signal mast at

Bülk Lighthouse, at Bülk Lightvessel, on the balustrades of Friedrichsort Lighthouse, at the battery from which practice take place, and on board all police vessels.

Steam vessels having a speed exceeding 7 knots are permitted, under certain restrictions, to pass through the area during two intervals which occur approximately from 9h. to 10h. a. m., and from 11h. 30m. to 0h. 30m. p. m., but only with the sanction of the captain of the police, and one of the police boats must be communicated with before doing so.

When the above-mentioned intervals take place a black flag is hoisted at all the places where the red double pennant is shown, and also at Düsternbrook Signal Station, and when flag A of the International Code is hoisted at the last place, between 3h. and 4h. p. m., it denotes that there will be no practice on the following week day.

At the conclusion of night firing the police vessels fire rockets which emit two green double stars in succession.

Torpedo practice takes place in Strander Bight, the limit of the area to the northward and westward being the coast between the torpedo station and Bülk, and to the southward a line from Strander Bight torpedo station to Kiel Buoy, No. 4. The times between which the practice takes place are as follows:

April to September.—From 6.30 a. m. to 6.30 p. m.

March to October.—From 6.30 a. m. to 5 p. m.

February and November.—From 7 a. m. to 4.30 p. m.

January and December.—From 7.30 a. m. to 4 p. m.

The signal that firing is in progress is a red ball shown at the tower of the torpedo station, and when it is hoisted anchorage is prohibited in the practice area, and any vessel anchored in it must leave.

Targets unavoidably left out at night will sound a bell.

Town.—The town of Kiel, one of the oldest in Holstein, and the headquarters of the German Navy, is picturesquely situated on the west side of the head of the harbor, and has a naval academy, and a university, founded in 1665; it is the chief war harbor of Germany, and in addition, is a considerable depot for the trade between the Danish Islands and the Continent.

The old town is badly built, with narrow, crooked streets, but between Kleiner Kiel, a pool in the town, and Düsternbrook Woods a new town, with some handsome buildings, is now situated. The Schloss or Palace, close southwest of Barbarossa jetty, is sometimes occupied by Prince Henry of Prussia, and southwest of it is Nicolaus Church, built in 1241; here also is the market place and the Rathaus.

There are museums, theaters, a library, and numerous public buildings; in 1914 the population of Kiel and Gaarden combined was about 225,000. It is also the residence of the commander in chief of

the Baltic Naval Station, and the lighting and buoyage of the harbor is under the supervision of an imperial service captain. The principal agent of the Sea Observatory undertakes the adjustment of compasses, rating chronometers, etc.

Communication.—Steamship communication with Copenhagen, Göteborg, Bremen, Brunsbüttel, Lübeck, Stetten, Danzig, and Rendsburg. There is regular mail steamer service twice daily throughout the year with Korsör, and by rail with all parts of Germany, the railway station being near the head of the harbor.

Small steamers ply in all directions from Jensen's Jetty, opposite the floating dock, and cross the Gaarden every five minutes, and electric tramways run in the streets and to some of the suburbs. The post and telegraph is also near Jensen's Jetty.

Coal and supplies.—From 8,000 to 10,000 tons of coal are kept in stock, and about 400,000 tons were imported from the United Kingdom in 1909; the coal is put on board in bulk or in baskets and from 300 to 400 tons could be loaded in 24 hours, the depths alongside the wharf being from 17 to 20 feet.

Fresh meat, vegetables, and bread can be obtained, and good water in large quantity can be supplied by the naval yard; a contractor has two water tanks, each holding about 2,000 gallons.

Ballast can be obtained through several firms.

Repairs.—In addition to the Imperial Dockyard, ships are built and repairs executed at Howaldt's Yard, on the north side of the entrance to Schwentine River, where there are nine slips, the longest being 750 feet in length.

At Gaarden, on the east side of the head of the harbor, are the Germania ship and engine building yards with a number of large and small slips, and provided with all necessary appliances; repairs of any kind can be executed, a turntable crane will lift 150 tons, and a mast crane 60 tons.

The cranes in the Imperial Dockyard, which are only at the disposal of private individuals under exceptional circumstances, consist of two floating cranes, lifting 100 and 40 tons, respectively, and a fixed crane lifting 60 tons, all worked by steam.

Other shipyards are those of Scharstein and Schutt & Scharstein firms, the former situated eastward of Howaldt's yard and the latter near Monkeberg Pier.

Hospital—The Academical Hospital, and several large private hospitals can receive a considerable number of patients.

Quarantine.—With the exception of water police regulations for the Imperial Dockyard, the same regulations regarding quarantine hold good as in other German harbors. The quarantine hospital at Vossbrok can accommodate 24 patients, and the landing pier has a depth of 2½ fathoms alongside it.

Time signals.—The time signal, made from the tower of the artillery storehouse, 100 feet in height, in the Imperial Dockyard, in the immediate neighborhood of the entrance, consists of a black ball, 112 feet above high water, which drops daily at noon mid-European time, equivalent to 23h. 0m. 0s. Greenwhich mean time, and at 1h. 0m. 0s. mid-European time, corresponding to noon Greenwich mean time.

A time signal is also made on the west side of the harbor, from the tower of the Naval Barracks, 128 feet in height, situated near Wiker Bight, and consists of a black ball, which is dropped from an elevation of 149 feet above high water, twice daily, at noon mid-European time, corresponding to 23h. 0m. 0s. Greenwich mean time, and again at 1h. 0m. 0s. mid-European time, corresponding to noon Greenwich mean time.

In each case the ball is hoisted at half-mast 10 minutes before the signal, and close up at 3 minutes before dropping, and a gun is fired on the guard ship at the time of the first signal.

The following signals will be made at both places in the event of the inaccuracies mentioned:

If the signal is incorrectly made, a red ball will be hoisted on one of the wire ropes of the platform, within five minutes of the time of the signal, and will remain so for five minutes, and if the ball should have failed to drop the red ball will be hoisted halfway up within five minutes of the time of the signal and remain in this position until the time ball is dropped at the next signal.

In the event of the apparatus being out of order, the red ball will be kept hoisted halfway up, to indicate that the signal can not be made.

Observatory.—At the Star Observatory of the University there is an ordinary observation station, which supplies material for working out storm warnings, and for investigating weather conditions on the German coast to the Sea Observatory.

Towns on the fiord.—Friedrichsort is a garrison town with a population of 2,541 in 1900; it has a hospital.

Labö, on the east side of the fiord, had 1,230 inhabitants in 1900.

Water can be obtained from wells, and some small repairs might be executed.

Trade.—The chief exports are grain, oil, and pulse, and imports coal, peat, coke, stone, and wood.

Dietrichsdorf, a town on the north bank of the Schwentine River, had 4,347 inhabitants in 1900.

Neumuhlen, a village near the entrance to the Schwentine River, had a population of 913 in 1900; it has large steam mills and a depth of 11 feet at the quay, the depth in the approach, which is buoyed, being 13 feet.

Wellingdorf is a fishing village on the south side, with a fishing-boat harbor.

Storm signals are shown at Wellingdorf. (See Chapter I

Ellerbeck, on the east side of the harbor, has also its har the Schwentine River, near its mouth; it had a population of

Water can be obtained from the Schwentine River above th and at the ferry wharf there is a fresh-water conduit leading the upper part of the river.

Trade.—Meal and bran are exported from, and grain, stone building stones, and pig iron imported to, the river.

Kaiser Wilhelm Canal, entered about 1¾ miles southw Friedrichsort and 2½ miles northward of Kiel, forms an alter waterway for vessels passing in or out of the Baltic, shortenii distance in a number of cases, and also avoiding the intricate gation of the Belts under unfavorable circumstances.

In its total length of 53.3 miles it traverses Schleswig, Ho and at its western end enters the Elbe River at Brunsbüttel, 15 eastward of Cuxhaven; the distances are shown by kilometer on the side of the canal, the zero being at Brunsbüttelkoog, eas The land is generally flat and monotonous, and the view is im by the high banks.

Lights.—The following lights are shown at the entrance canal:

On the outer entrance point, on the north side, a fixed electric light is exhibited, at an elevation of 72 feet above high from a red cylindrical brick tower, 67 feet in height, and vis miles.

On the extreme of the outer entrance point on the south sid with the same elevation and visibility, a fixed red electric li shown from a white iron framework on a red masonry bas whole 68 feet in height.

On the north and south sides of the North Lock are gra standards, 13 feet in height, the northern exhibiting, at an ele of 24 feet above high water, a fixed electric light with whit green sectors, and the southern, at 24 feet, a fixed electric light white and red sectors; these are visible 1 mile, the red and lights showing outward and white light inward.

Similar standards to the preceding stand on each side of the Lock, the northern exhibiting a fixed red electric, and the soutl fixed green electric light, both being at an elevation of 25 feet high water and visible about 1 mile.

The canal is lighted throughout by electricity, the lights bei arranged that its center line is pointed out to vessels.

Entrance locks.—At each entrance are two chamber locks, feet in length and 147 feet in width, 45 feet in depth, parallel t other, one being usually for entrance and the other for exit.

Dimensions—Depths.—The canal has a depth of 36 feet below mean surface level. The breadth at the surface is 335 feet and at the bottom 144 feet.

Passing places.—In addition to the upper Eider Lakes there are 10 passing places for large vessels, which are approximately 7 miles apart, and vary in length from 650 to 1,500 yards, with a breadth of 200 feet.

A turning place suitable for vessels of any size is situated in the Audorfer See, eastward of Rendsburg; it has four mooring buoys for swinging vessels, and eight buoys for mooring are in the deep water of Schirnauer See, about 400 yards northeastward of Audorfer See.

A lock at Rendsburg, connecting the canal with the lower Eider, has a length of 270 feet, a breadth of 40 feet, and a depth of 16 feet on the sill at low water in the Eider.

The sharp bends which formerly existed at Knoop Coppice and Lorensau no longer exist, the course of the canal having been straightened, leaving two crescent-shaped islands, on one of which near Holtenau, it is proposed to establish a coaling station.

Straightening the curves in the canal and increasing the size of the locks and the passing stations, when completed, will allow the largest sized vessel to pass through the canal.

Buoyage.—In the upper Eider Lakes, in the Borgstedt narrows, and at Rendsburg are light beacons and buoys, those on the north side of the center line being black buoys, carrying white lights; on the west side, and those south of the center line being red buoys with orange-yellow lights.

Bridges.—Four lines of railway cross the canal by bridges. The bridges at Grünental and Levensau, which are fixed, are also for road traffic, and have a breadth of span 513 and 535 feet, respectively, with a height of 138 feet above the mean level of the water.

At Taterpfahl and Levensau are swing bridges, also for road traffic.

There are also swing bridges for road traffic at Holtenau and Rendsburg, and 13 ferries throughout the canal.

Lloyd's signal station.—Holtenau is a Lloyd's signal station.

Anchorage.—The anchorage off the entrance to the canal, known as Holtenau Roadstead, which is used by vessels about to enter, or those that may have left the canal, is divided into two by an area in which anchorage is prohibited, but vessels may anchor in about 6½ fathoms northward of an imaginary line extended from the fixed green light on the northern side of the entrance to Holtenau outer harbor, in an 86° direction, or southward of the chimney of the engine house (which carries a flag) in line with a beacon on the foreshore bearing 276° in about the same depth.

By night the southern limit is fixed by two fixed white lights shown from the chimney and beacon, respectively.

Pilotage.—All vessels practically are subject to compulsory pilotage, and vessels towed may be obliged to employ one on each vessel.

The pilot stations are at Holtenau and Brunsbüttelkoog, and also at Nubbel, 35½ miles from the west end, where changes in pilots take place; pilots board vessels at the east end, between Friedrichsort and the entrance to the canal.

Pilot signals.—The national flag at the fore, or P T of the International Code, both having the answering pennant below them, are the signals for a pilot by day, and by night two fixed white lights placed horizontally and not less than 3 feet apart at the bow.

Signals in answer are only made by night, the signal "Understood" being made by three fixed white lights placed vertically on the entrance-signal mast.

If a pilot can not be sent, pennant D is hoisted below the Imperial service flag by day, or three fixed red lights placed vertically by night.

General directions.—The canal may be entered at any time, and navigable by night as well as by day, the maximum speed being fixed at 8 knots, except for vessels over 2,000 gross registered tonnage and 16 feet draft which are not allowed to exceed 6½ knots and the speed must be further reduced near turns with high banks and when passing dredgers or other vessels working in the canal.

Although tugs are available at both ends the pilots prefer to use the vessel's engines, and pilotage is compulsory for all vessels, commencing at the east end at Friedrichsort and at the southwest end at Brunsbüttel.

The rules to be observed in the canal will be found in the General Regulations, a copy of which will be supplied on request.

Coal.—About 4,000 tons of coal is kept in stock at Holtenau.

Water level.—At Holtenau the greatest range, about 17 feet, is due to the wind, but at the western end it is about 8½ feet and depends upon the tide, so that while the locks at the former are in daily use, those at Brunsbüttelkoog are only opened for the passage of vessels or for draining the canal which, as the canal falls toward the west end, is done by opening the locks on the ebb.

Ice.—Traffic in the canal is seldom interrupted by ice formation before December and generally the east winds of January are the first to bring severe frost.

Ice breakers, assisted by the wash of steam vessels, counteract the formation of ice in the canal, which may be assumed to be passable as long as Kiel Fiord and the Elbe are open. (Average ice conditions at both entrances, see Appendix.)

Hohwacht Bay.—The coast eastward of the entrance to Kiel Fiord, as far as Schönberg Beacon, has been described, and from that beason it trends southeastward for about 14 miles, and then turns east-northeast for 10 miles to Heiligenhafen, forming Hohwacht Bay.

Hessenstein Tower, 56 feet in height, and situated on Pillsberg, a wooded hill, 118 feet high, on the west side of Hohwacht Bay, is an excellent landmark, being visible over nearly the whole of Kiel Bay, and southeastward of it are Lütjenburg and Blekendorf Churches, with those of Hohenstein and Oldenburg on the east side of Hohwacht Bay, all of which are conspicuous.

Hansuhn Church, 3 miles southward of the head of the bay, has a pointed tower and is easily recognized by having a mill near it.

The eastern side of the bay is high and bare, Wandewitz and Johannisthal, two hills, being 220 and 106 feet high, but eastward of them, toward Heiligenhafen, the coast becomes flatter.

Obstructions.—Experimental obstructions marked by red buoys are occasionally laid near the shore in the western part of the bay. When these buoys are in position navigation is prohibited in their vicinity.

Depths offshore.—From abreast of Schönberg Beacon, where the shore bank is about 1,600 yards off within a depth of 3 fathoms, it closes the shore and for 5 or 6 miles is about ½ mile broad, after which, with the exceptions of between Todendorf and Lippe and northward of Dannau See, the 3-fathoms contour line is nowhere much more than 400 yards offshore.

With Schönberg Church between the bearings of south-southwest and west-northwest there are some patches of 5½ fathoms nearly 3 miles offshore, and about 1 mile offshore northwest of Weissenhaus is Eitz Ground, a patch of 3 fathoms; with these exceptions the coast is clean.

Stein Warder, a narrow strip of land, extends about 1 mile east-southeast of the highland on the east side of the bay, and further eastward is Gras Warder Island, nearly 1½ miles in length, parallel to and ½ mile off the coast.

The whole of this last stretch is foul, the shore bank, known as Schabernack and Warder Hook, extending for 1,400 yards; the town of Heiligenhafen can only be seen between the extremes of Stein Warder and Gras Warder, when abreast it.

From abreast the east end of Gras Warder the coast becomes lower, and about Grossenbrode there is a flat meadowland, but at Papenort, farther northeast, it is again high. Grossenbroder Bight is shallow and foul, with several rocks on the shore bank, which extends irregularly for 1½ miles.

Heiligenhafen and Grossenbrode Churches, some cairns on the highland behind Heiligenhafen, of which the westermost is most conspicuous, a factory chimney near that town, and the ferry piers in Fehmarn Sound, are all landmarks.

Buoys.—On the eastern edge of the shore bank extending northward of Gras Warder; are two white spar buoys, the northern surmounted by two triangles pointing upward, the southern with similar triangles, but pointing away from each other.

Heiligenhafen, a small harbor on the coast within the west end of Gras Warder Island, consists of an outer quay, about 500 feet in length, in an east by south and opposite direction, joined to the mainland at its west end and to the island by a causeway, about 950 feet in length, at its east end, from which end also a short arm extends southeast by south, with an entrance facing east, about 120 feet in width.

Further eastward, and on the north side of the entrance channel, is a detachable breakwater about 950 feet in length in a southeast and opposite direction, with an angle to the northeast.

It is approached by a dredged channel, in which there is a depth of 13 feet, and the same depth in the center of the harbor, while at the quays there is from 10 to 11 feet, but continuous winds from the westward lower and from the eastward raise the level about 2 feet, which is the average, but during an exceptional storm flood there was about 9 feet difference.

Lights.—At Strandhaus, on the south side of the entrance to the dredged channel to Heiligenhafen, a yellow tower, 31 feet in height, exhibits, at an elevation of 49 feet above high water, an unwatched fixed light, with white, red, and green sectors, which are visible, respectively, 8, 6, and 5 miles. (For sectors, see Light List.)

Leading lights.—Near Heiligenhafen two fixed red leading lights are shown at elevations of 30 and 23 feet above high water from black and white masts, respectively; the lights are shown from August 1 to March 31 and are visible 2 miles; they are in line 174°, are 80 yards apart, and lead through the fishermen's channel westward of Gras Warder Island.

Buoyage.—A red beacon fairway buoy, surmounted by a ball, and with "Heiligenhafen" in white letters on it, is moored on the north side of the entrance to the dredged channel; in winter it is replaced by a small red barrel buoy, with the same top mark. The channel is buoyed in accordance with the German system. (See Chapter I.)

Beacons.—Two beacons, surmounted by triangles pointing upward, stand on the bank off Warteburg Point, and when in line lead through the outer part of the dredged channel.

Anchorage.—Good anchorage may be obtained in the roads, in a depth of 3¾ fathoms, with the lighthouse at Strandhaus bearing 220°, and small vessels can anchor nearer the entrance to the channel, where they will have better shelter.

Pilots may be obtained, and in addition to piloting to the harbor can take vessels to Neustadt, Travemünde, Kiel, Eckernförder Bay, Kekenis, Nyborg, and Fredericia.

Tugs.—Small steam vessels, trading with Fehmarn, undertake towing vessels.

Directions.—When within the outer shoals, and approaching the entrance to the channel, from the northward, Petersdorf Church should be kept open eastward of Orth Village, bearing 11°, as a stern mark, until the easternmost mill, at Heiligenhafen is open of the westernmost one, about 268°, when the leading beacons should be kept in line until abreast of Warteburg, the tongue of land extending from the south side, after which the buoys must be followed.

Ice.—The channel to the harbor freezes quicker than Fehmarn Sound or the anchorage, and should the ice conditions in Fehmarn Belt or Sound be severe, good shelter may often be obtained in the anchorage.

Storm signals are shown from a signal mast situated on Kiekut, a tongue of land northward of the harbor, and at the mast, and near the quay, are boxes containing weather telegrams. (See Chapter I.)

Life-saving station.—A lifeboat is stationed at Heiligenhafen, and a rocket apparatus is maintained.

Town.—Heiligenhafen, a town with a population of 2,415, stands on the coast, southwest of Gras Warder Island.

Communication.—Regular communication by steamers is maintained with Kiel, Lübeck, and Fehmarn, and the town is the terminus of the line from Kiel and Lübeck; there are post and telegraph offices in the town.

Coal and supplies.—About 800 tons of coal are kept in stock, and fresh provisions, in small quantities, may be obtained; water is from wells in the town. Some small repairs to engines and boilers, and to wooden vessels, might be executed.

Trade.—The exports are colonial goods, grain, cereals, potatoes, building wood, timber, chalk, tiles, and firewood, and the imports grain, flour, butter, cheese, and pottery.

Fehmarn.—The island of Fehmarn, which is separated from Holstein by Fehmarn Sound, is about 12 miles in length, in a northwest and opposite direction, and 7 miles in greatest width; it is fertile and well cultivated, but has no woods.

The principal objects, as marks, are Petersdorf Church toward the west side of the island, Bannesdorf Church, about 1¼ miles south-southwest of Marienleuchte Lighthouse, Landkirchen, near the center

of the southern part of the island, and Burg Church, 4½ mile west of Staber Point; besides these the lighthouses at Flügge Markelsdorf, Marienleuchte, and Staber Point are good lar

West coast.—The south extreme of the west coast is a tongue of land extending for ½ mile in a southeast direct forming the western entrance point to Orther Bay. From tl the west coast trends for about 1 mile northwestward, and the northward for nearly 6 miles; Flügge Village is close to t 1⅓ miles from the south extreme, and between it and Mark Point, the north extreme, the coast is all protected by dykes.

Light.—About ½ mile southeast of Flügge is an octagona red brick tower, 51 feet in height, having a dwelling near it, a the tower an unwatched fixed white light is exhibited, at an e of 57 feet above high water, which is visible 13 miles. (For visible, see Light List.)

This light is used, with a light at Strükkamp Point, to fo ing lights for Fehmarn Sound.

Flügge Sand.—Off Flügge Village the shore bank, u name of Flügge Sand, extends for 2¼ miles westward, wi depth of 3 fathoms, and is further continued in a tongue water, with depths under 5 fathoms, for 6 miles.

Buoy.—About ⅔ mile westward of the extreme of the shoal, and 8¾ miles from Flügge Village, is a white can whis surmounted by two triangles, pointing toward each other, " Flügge Sand W " in white letters on it.

Shore bank.—Northward of Flügge Sand the shore banl a depth of 3 fathoms, gradually closes the shore until west Markelsdorfer Point it is only about ½ mile offshore; the contour line off this part is generally about 2½ miles from the

Markelsdorfer Point, the north point of the island, is tl ern angle of a narrow strip of land running along the no of Fehmarn, and inclosing Nördlicher Binnen Sea, a shallo of water.

Light.—Wester Markelsdorf Lighthouse is an octagona yellow brick tower, 55 feet in height, with a yellow dwellin about ⅔ mile south-southwest of Markelsdorfer Point; it ex an elevation of 52 feet above high water, a fixed white ar flashing light, visible 12 miles.

Signal station.—Wester Markelsdorf is a State signal with telephonic communication.

North coast.—From Markelsdorfer Point the north coa ing in an east by south direction, for about 6½ miles, to Oh Point, is nearly all the narrow strip of land already mentione also protected by dikes; Puttgarden Village, with about 300 ants, is situated about 1 mile westward of Ohlenburgs Poi

Light.—Marienleuchte Lighthouse, situated close southwestward of Ohlenburgs Point, is a square, yellow tower, 59 feet in height; it exhibits at an elevation of 93 feet above high water, a flashing white light visible 15 miles.

Fog signal.—A siren gives two blasts, each of three seconds' duration, separated by 6 seconds, and followed by an interval of from 60 to 70 seconds.

Tide gauge.—At the landing place, near the lighthouse, is a self-registering tide gauge, and during the years 1896–1898 the highest and lowest levels above and below mean which were registered were 4¼ and 5 feet, respectively.

Depths offshore.—Between Markelsdorfer Point and Ohlenburgs Point the shore bank, within the depth of 3 fathoms, is generally from ½ to ¾ mile off, but at nearly 5 miles from the former point, Puttgarden Reef, a dangerous shoal, extends for 1¼ miles northward of the coast, having depths under 1 fathom at more than 1 mile off; the 5-fathom contour line, which passes about 1½ miles off the first part of the coast, closes it at Puttgarden Reef and is close to the extreme of this shoal.

A detached shoal, with a depth of 3 fathoms, lies near the 5-fathom contour line, about 3 miles eastward of Markelsdorfer Point, and there are other patches of 3¼ fathoms, mostly small in extent, near the same contour line.

Buoy.—A red conical buoy, surmounted by a ball and marked "Fehmarn Belt," is moored close outside the 5-fathom contour line about 1 mile eastward of the 3-fathom patch.

Whistlebuoy.—A red conical whistlebuoy is moored off the extreme of Puttgarden Reef.

Life-saving station.—A lifeboat is stationed near Puttgarden village.

Submarine telephone cable.—A cable, which crosses Puttgarden Reef to Sylt holm, on Laaland, is marked on Fehmarn by two green beacons surmounted by triangles.

East coast.—The coast from Ohlenburgs Point trends in a south-southeast direction for 6 miles to Staber Point, and is steep and uninviting.

Light.—On the extreme of Staber Point a cylindrical yellow tower, 73 feet in height, with a red lantern, exhibits, at an elevation of 84 feet above high water, a white group occulting light, visible 15 miles.

There is a dwelling near the lighthouse.

Presen Shoal.—From Ohlenburgs Point the shore bank on this stretch of coast is narrow, except immediately southward of that point, where Presen Shoal, an extension of it to the eastward for about ⅝ mile, has a depth of 2 fathoms.

Rocks lie on the edge of the shore bank about 2 miles southward of Presen Shoal and eastward of Staber Point, and it should not be approached too closely in a small vessel.

Buoys.—A red spar buoy marks the edge of the 5-fathom contour line, 1½ miles eastward of Ohlenburgs Point.

A conical red buoy, surmounted by two red balls, is moored on the 5-fathom contour line, 1¾ miles 108° from the extreme of Presen Shoal.

A white can buoy, surmounted by two triangles pointing downwards, marks the edge of the shore bank southeast of Staber Point.

The shoal which extends within the 5-fathom contour line 1,600 yards eastward from Staber Point is marked by a white spar buoy, with east topmark (two triangles, bases together), marked "Staberhuk Ost," moored about 1.1 miles eastward of the lighthouse.

Anchorage.—Good anchorage may be obtained with offshore winds in depths of from 3¼ to 3¾ fathoms, over firm light-blue clay, off Presen village.

Fehmarn Belt, the channel between the north coast of Fehmarn and the south coast of Laaland, is 10 miles in width at its narrowest part between the land on either side, and 7⅞ miles between the 5-fathom contour lines on each side.

The depths in the eastern part are from 14 to 16 fathoms, but in the western part Öjet bank, with from 6½ to 10 fathoms, occupies the middle of the channel. A channel with from 11 to 20 fathoms passes close southward of this bank.

Lightvessel.—Fehmarn Belt Lightvessel, moored nearly 5 miles northeast of Markelsdorfer Point, has a red hull, two masts with a tower between them, and "Fehmarn Belt" in white letters on the sides. It exhibits, at an elevation of 52 feet above sea level, a flashing white light visible 13 miles.

Fog signal.—During thick or foggy weather a foghorn, worked by compressed air or steam, gives a blast of 4½ seconds duration, followed by silence for 15½ seconds. Should the horn be disabled a bell will be struck continuously for 5 seconds, with silence for 30 seconds, and in the event of a vessel's signals being heard a gun will be fired in answer every 5 minutes.

Vessels seen standing into danger will be warned by signals made with flags, or, if possible, with guns.

Submarine fog bell.—In addition to the fogsignal a submarine fog bell near the lightvessel gives nine strokes every 45 seconds, thus: A group of nine strokes, each stroke being separated by an interval of 2½ seconds, followed by a silent interval of 25 seconds duration. (See Chapter I.)

Directions.—The belt has a northwest and southeast direction, and a mid-channel course, about 125°, should be steered, particularly

avoiding the dangerous shore bank, with off-lying shoal spots northward of Fehmarn, to do which a vessel should not go into less than 11 fathoms on that side; a vessel will be eastward of these dangers when the high land at Katharinenhof is in line with Oldenburgs Point, bearing 156°.

Care is necessary during foggy weather not to confuse the fog signals from the lightvessel and Marienleuchte, which may be heard at the same time.

Current.—The current in the belt usually follows the direction of the channel, but owing to the influence of the wind it not infrequently sets obliquely either toward the north shore or southward to Fehmarn, so that care is necessary to check the position by bearings in clear weather, and in thick weather to continually use the lead.

Instances of vessels grounding to the southward and southeastward of Hyllekrog tend to show the existence of a northerly set, and vessels stranding near Marienleuchte and on Puttgarden Reef may be due to westerly current deflected to the southward in the east entrance to the belt.

Fehmarn Sound, separating Grossenbrode Peninsula from Fehmarn, is about 4 miles in length and ⅜ mile in width at its narrowest part; on its eastern side it is obstructed by a bar, with depths of from 1¼ to 1¾ fathoms, and more than 1 mile in width, which stretches across from the peninsula to the island, and has a dredged channel, with a depth of 16 feet, through it.

South shore.—From Strandhaus the coast curves round to the northeastward for 2½ miles to Papenort, with an inlet extending nearly 1 mile southward, on the east side of which is Grossenbrode village, with about 500 inhabitants, and a church.

From Papenort the north side of the peninsula, extending eastward for about 1½ miles, is indented by a small bay having the ferry harbor on its east side; the railway from Heiligenhafen and Oldenburg runs onto the pier.

Telegraph cable.—A high tension electric cable is laid across the sound between the ferry harbors. A red-brick cable hut, marked "K" on the side of the sound, situated on one of the piers at each harbor, indicates the position of the cable.

Grossenbroder Reef.—Grossenbroder Bight is shallow and foul, with several rocks on the shore bank, and Grossenbroder Reef extends for 1½ miles westward of Papenort, with depths of from 1¼ to 2 fathoms; for 1 mile westward of its extreme there are patches with depths of from 2¾ to 3 fathoms.

The northern edge of the shore bank, from the northwest point of Grossenbroder Reef, extends for 2¼ miles eastward, forming the south side of Fehmarn Sound, and is distant ½ mile from the north

coast of the peninsula; the shore bank eastward of the ferry is narrower, being about 400 yards in breadth.

Buoys.—A conical red buoy, surmounted by a staff and ball, is moored off the northwest end of Grossenbroder Reef. Two red can buoys, each surmounted by a staff and ball, mark the north edge of the shore bank to the eastward.

Grossenbrode Ferry Harbor is protected by stone piers, and has depths of from 8 to 10 feet; the railway ferryboats and motor boats, which ply on Fehmarn Sound, use this harbor.

Light.—A fixed red light is shown at the harbor from sunset to 8 p. m. and from 6 a. m. to sunrise.

Ferry Harbor.—The ferry harbor in the sound, situated about 1 mile eastward of Papenort, is formed by two stone moles and has a depth of about 2 fathoms.

Lights.—Two unwatched fixed orange-colored lights are shown from black masts in the harbor during the winter months and during summer when the ferry is arriving or leaving.

North side—Orther Bight.—Krumm Steert, the narrow tongue of land southward of Flügge, is the western entrance point to Orther Bight, which is 2½ miles in width between that and Strukkamp Point, the east point, and from between these points the bay recedes 1⅝ miles.

The shore bank, within the depth of 3 fathoms, is more than 1 mile southward of Krumm Steert and about the same west-southwest of Strukkamp Point, filling the whole of Orther Bight, and the shore bank with depths under 1 fathom borders the shores of the bight to a distance of nearly 1 mile.

Buoy.—A black conical buoy, with ball topmark, marked "Breiton Barg," is moored on the south extreme of that shoal.

Orth Harbor is formed by two piers, the eastern extending from the village in a southerly direction for 650 feet, and western parallel to it about 1,800 feet from the shore on the west side, the entrance between their heads being about 60 feet in width; within the harbor is 177 feet in width between the quays, which have a length of about 600 feet.

The harbor is approached by a dredged channel about 700 yards in length through the shore bank, the depth in it being about 14 feet, with the same depth in the harbor, but the breadth of the channel between the pierheads is only 50 feet.

Leading lights are exhibited from black and white beacons, with triangular topmarks 16 and 6 feet in height, respectively, about 500 yards apart, and in line bearing about 350°.

The rear light is fixed white and the front light fixed red, but they are unwatched and only shown when steamers are expected.

Buoyage.—A red fairway beacon buoy, surmounted by a ball, and with "Orth a/F" in white letters on it, is moored at the entrance to the dredged channel, which is buoyed in accordance with the German system. (See Chapter I.)

Anchorage.—The best anchorage is in a depth of 2½ fathoms, on the line of the leading beacons, about 600 yards outside the buoys.

Pilots.—A pilot at Orth, in addition to taking vessels to the harbor, can pilot vessels through Fehmarn Sound and to Neustadt, Travemünde, Kiel, and Eckernförder Bay, also through both belts; the boat flies the German flag.

Directions.—Orth Mill, in line with the easternmost and first white house at Orth, bearing about 350°, lead to the vicinity of the entrance to the dredged channel, and the black and white beacons should be brought in line 350°, which will lead between the buoys through the dredged channel, special care to keep these in line being necessary when passing between the pierheads.

Storm signals are shown at Orth. (See Chapter I.)

Ice.—The harbor freezes earlier than Kiel Bay and the channels around Fehmarn.

Orth, a village with about 150 inhabitants, has regular communication by steamers with Heiligenhafen, Kiel, Lübeck, and Burgstaaken, and there are post and telegraph offices.

Coal and supplies.—About 300 tons of coal are kept in stock, and fresh provisions in limited quantities may be obtained; water is from wells in the village; a revolving crane, lifting 5 tons, is situated on the etst side of the harbor.

Trade.—The chief exports are grain and cattle, and imports coal and wood.

Lemkenhafen is a village of about 200 inhabitants, on the northeast side of the bucht; a pilot resides here.

Strukkamp Point is the eastern entrance point to Orther Bight, and from it the low north shore of Fehmarn Sound trends in an eastsoutheast direction for about 3 miles to the entrance to Burgstaaken.

Light.—Near the extreme of Strukkamp Point, from an iron post with drum, 16 feet in height, an unwatched flashing white light is exhibited, at an elevation of 16 feet above high water, and is visible 9 miles.

Signal station.—There is a signal station at Strukkamp Point.

Ferry Harbor.—About 1 mile southeastward of Strukkamp Point is a small ferry harbor, sheltered by stone moles, and having an average depth in its center of nearly 2 fathoms; it is used by the ferry steamers and motor boats, which latter are a means of communication across the sound.

from black masts in the harbor during the winter months, and during summer on arrival and departure of the ferry.

Tide gauge.—There is a tide gauge at the ferry harbor by which vessels may ascertain the level of the water in the sound.

Pilot.—An assistant pilot, not certificated, may be obtained here.

Shore bank.—From Strukkamp Point the north shore of the sound has a narrow shore bank, about 400 yards in breadth, which is rocky and steep-to.

Channel—Depths.—The entrance to Fehmarn Sound from the westward is about 1 mile in width between Papenort and Strukkamp Point, and the depths are from 3½ to 6 fathoms to the entrance of the dredged channel, which is 200 feet in width and has a depth of 16 feet; the western end of the channel is free from rocks, but there are some at the eastern end.

The depths in the channel are considerably affected by the winds, as the water falls sometimes 6½ feet below the mean level, and rises as much as 9½ feet, but a fall of 5 feet is not experienced every year, and one of 6 feet is rare. Gales from south-southwest to west cause the lowest level, the water falling with winds between south and west, and rising with those from north to east.

Buoyage.—The red beacon buoy, surmounted by a ball, on the northwest end of Grossenbroder Reef, is marked "Fehmarnsund W," and serves as a fairway buoy on the west side of the approach to Fehmarn Sound, and at the east end is a red and black vertically striped beacon buoy, marked "Fehmarnsund E," and surmounted by a ball; it is moored in about 4¼ fathoms water, slightly to the northward of the line of the leading lights in one.

The north side of the dredged channel is marked by five conical black buoys, and the south side by five red can buoys, each surmounted by a staff and ball.

Anchorages.—Vessels can anchor, in depths of from 3¾ to 4¼ fathoms, in the vicinity of the ferry harbors, but better anchorage can be obtained either at Heiligenhafen or Orther Bight.

Prohibited anchorages.—Anchorage is prohibited in an area near the telegraph cable, which crosses Fehmarn Sound, the area being marked by two gray can buoys, moored, respectively, 200 yards eastward and westward of a line joining the ferry harbors. The western buoy is marked "Ostlich nicht ankern," and the eastern "Westlich nicht ankern," meaning that anchorage is not permitted eastward and westward, respectively, of these buoys.

Anchorage is also prohibited with Flügge and Strukkamp Point Lighthouses in line, bearing 305°, and a fine will be imposed on those infringing these regulations.

Pilots may be obtained at Heiligenhafen, Orth, Lemkenhafen, and Burgstaaken; the pilots' boats carry the German flag.

Directions.—Petersdorf Church is generally the first mark seen when coming from the westward, after which Burg Church and Flügge Lighthouse will be distinguished, and on the south side Grossenbrod Church.

A position in the fairway of the western entrance is with Petersdorf Church in line with Flügge Lighthouse, bearing 38°, and Bergmühle Farmhouse in line with Fehmarn Ferryhouse, about 90°, and the latter mark may be steered for, passing northward of the red buoys marking the south side of the sound, and altering course to go in mid-channel, between the ferry harbors on either side.

When Flügge and Strukkamp Point Light-tower and iron post, respectively, are in line, bearing 305°, steer 125°, with them as a stern mark, which will lead through the dredged channel, between the buoys, but in a vessel of more than 13 feet draft, the level of the water should be ascertained from the tide gauge at Fehman ferry harbor, before entering the dredged channel.

A vessel coming from the southward, in steering for the eastern entrance to the sound, will find that Burg Church in line with the houses at Burgstaaken, bearing about 10°, will form a good mark to lead to the eastern fairway buoy.

By night.—Flügge and Strukkamp Point Lights in line, bearing 305°, lead through the dredged channel of the sound.

Current.—With winds from the north, through east, to south, a west-going current will be experienced in the sound, and with winds from south, through west, to north, an east-going set; the rates seldom exceed 2 knots, and after a sudden change of wind the current may set against it.

Ice.—Fehmarn Sound only freezes in very severe winters, and during a period of 24 years (1870–1893, inclusive) it has only had a sheet of ice over it on nine occasions. When ice commence to show in the adjacent waters, anchorage would be safer in Heiligenhafen anchorage or in Orther Bight.

Submarine telegraph cable.—From about ½ mile westward of the Ferry Harbor, on each side of the sound, a cable crosses it, and the direction is marked on both shores by two beacons.

Fehmarn—South coast.—From Burgtiefe, the eastern entrance point to Burger Bay, the coast trends in a direction somewhat southward of east, for 4 miles to Staber Point, gradually rising, but near latter point it falls steeply to the sea.

Grüner Ground, a narrow tongue of shoal, terminating in a heart-shaped patch, extends about 1,600 yards from the shore, southwestward of Wolfener Hals, the narrow strip of land forming the

west side of the entrance to Burger Bay; it has depths of from ½ fathom to 1 fathom and some rocks on it.

The shore bank, eastward of the entrance, is about ½ mile offshore, but gradually closes it to Staber Point.

Burgstaaken Harbor.—The entrance to Burger Bay is protected by two breakwaters, the western about 650 yards in length in an east by south direction, and the eastern about 500 yards southeast by south, the pierheads being 500 feet apart.

Burgstaaken Harbor, on the north side of Burger Bay, is about 200 yards in length, 125 feet in breadth at the entrance, which faces south, and about 200 feet in breadth inside, except near its head, where it narrows to 80 feet.

It is approached through a dredged channel, 50 to 60 feet in breadth, which has a northwest direction, for about 700 yards, and then a northerly one for 1,300 yards, the least depth in it being 14 feet, and the same in the harbor. The differences in level of water are the same as at Heiligenhafen.

Leading lights.—On the east side of the harbor are a mast and a wooden pole, 15 and 3 feet in height, and painted black and white, respectively, which exhibit, at elevations of 25 and 13 feet above high water, two fixed red leading lights.

At the north end of the harbor two red poles, 20 and 3 feet in height, exhibit, at elevations of 25 and 16 feet above high water, two fixed green lights. Both pairs of lights are visible 2 miles, but they are unwatched.

Beacons.—Two white beacons, each surmounted by a triangle, pointing upward, stand on the west side of the entrance to the dredged channel, the southern close inside the west pier, and the northern about 150 yards 358° from it.

A red beacon, surmounted by a sphere, stands on the east pierhead.

Buoys.—A red beacon buoy, surmounted by a ball, and with "Burg a/F" on it in white letters, serves as a fairway buoy and lies 900 yards southward of the east pierhead.

The dredged channel is marked on the west side by black conical buoys, surmounted by balls, with Dalben beacons between, and on the east by red stakes.

Storm signals are shown. (See Chapter I.)

Anchorage.—There is good anchorage, with northerly winds, in depths of from 2¾ to 3¾ fathoms, from 600 to 800 yards from the entrance to the channel.

Pilots.—A licensed pilot resides at Burgstaaken, and in addition to taking vessels in and out of the harbor can pilot them to Heiligenhafen, Orth, Lemkenhafen, Neustadt, Travemünde, Kiel, and Eckernförder Bay; his boat flies the German flag.

Directions.—Burg Church, in line with a solitary house on Burgtiefe, bearing 351°, leads to the fairway buoy, and the outer part of the dredged channel must be navigated by the buoys; the two beacons, surmounted by diamonds, in line, bearing 178°, used as a stern mark, lead through the latter part of the channel, or by night the fixed green leading lights in line.

The two fixed red leading lights lead to the east pierhead by night.

Burgstaaken, a village with about 200 inhabitants, is near the harbor, and the town of Burg, which is about two-thirds of a mile distant, has a population of about 3,000; there is regular steamship communication with Kiel, Lübeck, Heiligenhafen, and Orth; and post and telegraph offices.

Coal.—About 400 tons of coal are kept in stock; water is from wells.

Mecklenburger Bay—Lübeck Bay.—Between the east coast of Fehmarn and a line joining Darsser Ort and Gjedser, is Mecklenburger Bay, and on the west side of the latter, within a line joining Dahmeshöved and Great Klütz Head is Lübeck Bay.

Coast.—From Elandsort Point, the southern entrance point on the east side of Fehmarn Sound, the coast trends for 3 miles in a southwest direction to Löhrstorfer Bay, a shallow lagoon, and then turns to the southward for nearly 9 miles to Dahmeshöved; for the first 6½ miles, as far as Siggen, it is somewhat bare, but southward of that it rises to an average height of 30 feet, and is protected by dykes.

The shore bank extends from 600 to 1,200 yards within a depth of 3 fathoms, the inner part, between Elandsort Point and Löhrstorfer Bay having numerous rocks on it.

Sagas Bank, the center of which is about 3½ miles from the coast, east-southeast of Siggen, is irregular in shape, and about 3½ miles in length in a northwest and opposite direction, with a greatest width of 2 miles; the least depth over it is 4¼ fathoms, and vessels of deep draft should not pass between it and the shore, there being detached patches of 4¾ and 5 fathoms in that locality.

The most conspicuous objects on this coast are Grossenbrode Church, already mentioned, Berg Mill, near Seekamp, Siggener Mill, and Dahmeshöved Lighthouse.

Light.—Nearly 200 yards from the high shore of Dahmeshoved is an octagonal-shaped brown tower, 94 feet in height, which exhibits at an elevation of 111 feet above high water a fixed and flashing white light; the fixed light is visible 10 miles, and the flashing light 16 miles.

Signal station.—Dahmeshöved is a State signal station, and vessels can communicate by the International Code.

Schwarzer Ground, extending in two prongs, northeastward and east-southeast of Dahmeshöved, for about 1 mile, within the depth of

3 fathoms, has foul ground, and some rocks on its inner part; the 5-fathoms contour line is 1¼ miles from the point.

Buoy.—A white can buoy, surmounted by a staff and two triangles pointing away from each other, marks the 5-fathoms edge of the shoal.

Coast.—The coast from Dahmeshöved trends in a southwest direction for 10½ miles to Pelzerhaken, and to Grömitz, a little more than midway, it is low and sandy, but from the latter it becomes higher, although Pelzerhaken itself is low.

With one exception, about 2 miles from Dahmeshöved, where the shore bank extends about ⅔ mile, it is generally about 600 yards off, and clean.

Light.—On Pelzerhaken is a square white tower, 40 feet in height, which exhibits, at an elevation of 46 feet above high water, a fixed and flashing white light; the fixed light is visible 4 miles, and the flashing light 12 miles.

Signal station.—Pelzerhaken is a State signal station, and vessels can communicate by the International Code.

Buoy.—A spar buoy, white, surmounted by two triangles pointing downwards, is moored about ⅓ mile southeast of Pelzerhaken.

Walkyrien Ground, with a least depth of 3½ fathoms, extends for a distance of 2.2 miles in an east-northeast and opposite direction, with a width of 1.1 miles, within the 10-fathoms contour line; its shallowest part is about 3 miles southeast of the coast of Grömitz.

Neustadt Bay.—Pelzerhaken and Brodten Bay, 5½ miles apart, form, respectively, the north and south entrance points to Neustadt Bay, which recedes 4 miles westward of a line joining these points; in the northwest corner of the bay is Neustadt Harbor and town.

About 2½ miles within the northwest side of the bay is Gömnitz Berg, 300 feet high, and surmounted by a tower, forming a good mark, and other conspicuous objects are Alt Liebe, the watchtower, near Sierksdorf, at the head of the bay, and Travemünde Lighthouse and church.

Depths offshore.—On the north and southwest sides of the bay the shore bank is fairly narrow, being about ⅓ mile in breadth, but on the northwest side it extends for a mile, and on the south side is Stone Reef; there are also some patches of from 4¼ to 5 fathoms on the southwest and south sides, fully 1 mile offshore.

The depths in the outer part of the bay are from 11 to 12 fathoms, shoaling to 7 and 8 farther in.

Neustadt Harbor is formed by an inlet which extends in a northerly direction from the northwest corner of the bay, and communicates with an inland sheet of water to the northward of the town; this inlet has shore banks with depths under 1 fathom, bordering each

side, and a narrow channel of deeper water, extending up the middle of it.

In the harbor there are quays on both sides, at which vessels lie, their total extent being about 750 feet; the breadth of the outer part of the channel to the harbor is 130 feet, and of the inner part 65 feet.

The depth in the dredged channel and harbor is 20 feet, but winds from north-northeast raise the level an average of 4 feet, and those from south-southwest cause the lowest level, which reaches about 4½ feet.

Buoyage.—The fairway buoy is a red and black beacon buoy, surmounted by a ball, and with "Neustadt" on it in white letters.

On the edge of the bank on the east side are two white stakes, surmounted by red triangles, pointing toward each other, and with "Berg W 1" and "Berg W 2" in white letters on them.

On the edge of the western bank is a white stake, surmounted by black triangles, pointing away from each other, and with "Steinberg O." on it.

Dangers.—The east side of the entrance channel is formed by the shore bank extending about a ¼ mile from the shore, the inner part of which is known as the Berg; on the west side the shore bank, consisting of foul ground, extends to the eastward in a prong, with depths under 3 fathoms for 1¾ miles off the shore at Strande, and its inner part is named Steinberg.

Anchorage.—The best anchorage is in depths of from 2¾ to 3¼ fathoms off the fairway buoy, with Neustadt Church in line with the center of the entrance, bearing 3°.

Pilots.—A pilot may be obtained from the pilot station known as Jonathan Wiese, on the east side of the entrance, or at Neustadt, and in addition to piloting in and out of the harbor, these can take vessels to Travemünde and Fehmarn Sound; the pilot boat carries the German flag.

Directions.—Approaching Neustadt from the eastward, Pohnsdorfer Mill, in line with a yellow cliff southward of the harbor, bearing about 280°, leads from Pelzerhaken between the shore banks on either side, and when Neustadt Church is showing in the middle of the entrance 3°, alter course for it, which will lead to the fairway buoy, and the channel between the buoys can be followed.

Ice.—The harbor freezes, as a rule, at the same time as Lübeck Bay, but ice barriers seldom form in front of the harbor, as the ice is constantly driven away from Neustadt Beach.

Town.—Neustadt, a town with about 5,000 inhabitants, is a station on the railway between Eutin and Oldenburg, which is a branch of the line between Lübeck and Kiel; there are post and telegraph offices in the town.

Coal and supplies.—About 900 tons of coal are kept in stock; fresh provisions may be obtained, and water from wells in the town; some small repairs to machinery might be executed.

Trade.—The chief export is grain, and the principal imports consist of coal and wood.

Coast.—The coast between Neustadt and Travemünde is hilly and much wooded, but the hills do not approach the coast in all parts; near Brodten the coast is steep.

Himmelsdorf Lake, about 2½ miles in length, communicates with the sea, through Gose River, at Niendorf, about 2 miles westward of Brodten.

Stone Reef.—The coast at Brodten is fronted by foul, rocky ground, which extends northward, and northeastward of it for about 1 mile, within a depth of 3 fathoms, and it is continued, with depths under 5 fathoms, for 2¼ miles from the shore, in the latter direction; this shoal is known as Stone Reef.

Travemünde.—The bay which forms the estuary of the Trave River is about 2½ miles in width between the Brodten shore and that on the east side, and recedes about 2 miles in a southwest direction.

The lighthouse, a large bathing establishment, and Pötenitz Castle, on the east, about 1½ miles from the entrance, are all conspicuous.

Light.—On the north entrance point, about 400 yards within the shore line, is a gray cylindrical tower, 104 feet in height, with a flat dome; it exhibits, at an elevation of 101 feet above high water, a fixed white occulting and group flashing light, visible 16 miles.

Fog signal.—A tug is anchored, during thick or foggy weather, near the outer red spar buoy, and from it a steam siren gives two blasts in quick succession every three minutes.

Signal station.—Travemünde is a State signal station. (See Chapter I.)

Dangers.—The northeast extreme of Stone Reef is the outermost danger on the west side of the bay, forming the road, and from its extreme, 1 mile northeast of Brodten shore, the shore bank, on that side, gradually closes the coast, and at the entrance to the channel is about ½ mile in breadth.

Red Wete, a rock with a depth of 1 foot over it, lies 1,100 yards offshore, 1½ miles north by east of the north pierhead.

The shore bank, on the east side of the bay, is about 700 yards off, to the depth of 18 feet, but increases its distance from the shore near the entrance to the channel, where it is 1,400 yards in breadth.

Buoy.—A white conical buoy, surmounted by two triangles pointing away from each other, and having "Brodten O" on it, is moored about 600 yards northeast of Red Wete.

Entrance.—The entrance points to the river are prolonged seaward by two short stone piers, the northern having an easterly and

the southern a northeasterly direction; the width between the pier heads is 500 feet, but the navigable channel is only 350 feet, and outside the piers is a dredged channel, nearly 1,200 yards in length in a northeast direction, with a breadth of about 300 feet.

Leading lights.—On the south pierhead is a white beacon, 15 feet in height, which exhibits, at an elevation of 20 feet above high water, a group flashing red light, visible 6 miles.

On Priwall Peninsula, 607 yards 220° from the preceding, a red beacon, 46 feet in height, exhibits, at 56 feet above high water, a fixed white occulting and group flashing light, visible 16 miles.

On the north side of the river, westward of the town, two fixed green lights are exhibited at elevations of 31 and 22 feet above high water from green iron standards, 24 and 10 feet in height; they are 75 yards apart, in line, bearing 252°, and are visible 1 mile.

A fixed green light is shown from the easternmost pier on the north side of the river entrance.

Beacon.—On the north side of the entrance is a "Winkbake" or signal beacon, from which signals are made by a red ball.

Light and bell buoy.—A light and bell buoy, painted in red and black vertical stripes and marked "Lübeck," exhibiting an occulting white light every 3 seconds (eclipse 1½ seconds), is moored in the approach to the dredged channel at a distance of 1.3 miles 49° from Travemünde Lighthouse.

Whistlebuoy.—A red whistlebuoy, surmounted by a ball, is moored on the northwest side of the approach to the dredged channel.

Fairway Buoy.—On the southeast side of the approach to the dredged channel is a beacon buoy, surmounted by a red and white shield over a triangle pointing upward, and having "Lübeck" on it.

The dredged channel is marked on the starboard side by three red spar buoys, surmounted by balls, and on the port side by black conical buoys.

Inside the entrance the channel is marked by dolphins.

Anchorage.—The best anchorage in Travemünde Road is with the light tower bearing 233°, and Pötenitz Castle 185°, in a depth of 9¼ fathoms, the bottom consisting of ooze and clay, but westward of this it is mixed with sand.

Although a short, choppy sea is soon set up by winds from northeast to east-northeast, vessels have often ridden out severe gales at this anchorage.

Harbor.—Travemünde is the port for Lübeck, and the harbor extends from the north molehead for about 1 mile, with breadths varying from 100 to nearly 150 yards. On the town side are five landing piers for steamers, and on Priwall two coaling piers.

Depths.—The depth in the dredged channel is nearly 28 feet, and although gales from northeast lessen the depths in places, the depth

is generally maintained by dredging, and it is intended that there should be a depth of at least 5 fathoms in the roadstead, and 29½ feet in the harbor in 1912. The depth in the harbor at present is 26 feet, and vessels drawing 24½ feet are allowed to enter the port.

Winds from north, through east, to east-northeast, cause the highest levels, and those from west-southwest to west the lowest, the former reaching 8¼ feet and the latter 5½ feet, a difference in 3 feet occurring frequently; a rise of 10¾ feet was registered during the storm flood of November 13, 1872.

Storm signals.—Storm signals are shown from a mast standing on the quay, and a box containing weather reports will be found at the pilothouse. (See Chapter I.)

Life-saving station.—Travemünde is a lifeboat station, and there is a rocket apparatus on each side of the harbor.

Pilots.—There are, in addition to the chief pilot, 3 head and 18 under pilots, and pilotage is compulsory for all vessels entering the harbor, except foreign war vessels, pleasure yachts, and sailing vessels, and those under 200 cubic meters capacity.

All vessels drawing more than 21 feet water must take a pilot between Travemünde and Lübeck. The pilot boats carry the Imperial flag, with Lübeck arms in red and white, and a double eagle on it.

Tugs.—Several small steamers undertake towing vessels, and these are also fitted as ice breakers and have fire hoses.

Directions.—A vessel approaching from the northeastward will probably distinguish the high pyramidal towers at Lübeck, when abreast of Walkyrien Ground, but these are afterwards hidden behind the highland; the slender tower of Travemünde Church, standing in the level valley, the lighthouse, and the large building belonging to the bathing establishment will afterwards come in view.

On the eastern side of the entrance Volksdorf Mill, Pötenitz Castle, and Elmenhorst Church and Mill are all conspicuous.

Travemünde Church should be kept midway between the two southernmost large buildings of the bathing establishment until the white beacon (octagonal top mark) is in line with Priwall red beacon (quadrangular top mark), bearing 220°, which will lead through the dredged channel between the buoys, turning to the westward between the pierheads and the dolphins, marking each side of the harbor.

The state of the current must be considered, and if it is running out of the river the south side of the channel, when near the harbor entrance, should be kept.

In the event of a pilot being unable to go out on account of severe weather, a vessel might still enter the harbor with the aid of signals, which would be made from "Winkbake."

These signals are made by a red ball, and if the staff on which it is hoisted is quite perpendicular, it denotes that the vessel should continue the same course, but if it is inclined either to one side or the other, the vessel is directed to steer in the same direction as that to which it is inclined.

Should the staff, bearing the ball, have a direction pointing below the horizontal line, it indicates that no vessel can enter the harbor, and that anchorage should be taken up outside, in depths of from 5 to 6 fathoms, or that the vessel should remain at sea.

By night.—The fixed white and fixed group flashing red leading lights in line, bearing 220°, lead through the channel, until the two fixed green lights are in line, 252°, when they must be steered for.

Current.—With winds from north-northwest, through north, to east, an ingoing current is usually experienced, and with those between south and west, it generally sets outward. Immediately outside the entrance the ingoing stream sets in mid-channel, on the south side of the fairway toward the southwest, and on its north side southward toward the north pierhead.

The outgoing current splits in the entrance, one branch setting in the direction of the fairway, and the other southward toward the Mecklenburg coast; the streams attain a velocity of 4 knots.

Within the current sets inside the piers, in the direction of the river, but is deflected to the northward by the bend of the harbor, and close under the land are counter currents, attaining about half the rate of the main current.

Current signals.—The direction of the current is indicated from the "Winkbake," as follows:

Ingoing stream.—Ball on the north side of the beacon.

Outgoing stream.—Ball on the south side of the beacon.

Ice.—Except when Lübeck Bay is barred by ice from the Baltic the dredged channel into the harbor, and that in the river to Lübeck, is kept open by an ice breaker. The river is closed to low-powered steam and sailing vessels, on an average for about 12 days in a year. Three ice breakers are available for use. (See Average ice conditions, Appendix.)

Town.—The town of Travemünde, on the left bank of the river, has a population of about 2,100, and railway communication with Lübeck; there are post and telegraph offices in the town.

Coal and supplies.—About 100 tons of coal are kept in stock. Fresh provisions, in small quantities, may be obtained, and water from the town water system taken on board by hoses.

Trade.—The principal export in ships' provisions, and imports consist of fresh fish, wood, and coal.

Trave River.—Above Travemünde Harbor the Trave River has a general west-southwest direction, with several bends for nearly

11 miles, to Lübeck, and vessels of 21 feet draft can reach that town, the maximum draft being regulated from time to time by the harbor authorities.

At what is known as the New Cutting the river is crossed by Herrenbrüche, a double drawbridge, which has a maximum opening 164 feet in width and, when shut, the greatest height is 25 feet above the water. Between this bridge and Lübeck the river has a towpath on one bank or on the other bank.

Buoyage.—The channel of the river is marked on the starboard side by red dolphins surmounted by balls, and on the port side by black dolphins.

Between Travemünde and Lübeck lights have been established on several of the beacons. The red bacons, on the starboard hand, exhibiting flashing white lights every 4 seconds, and the black beacons, on the port hand, exhibiting group flashing red lights every 8 seconds, 2 flashes in each group.

In its narrowest parts the channel is from 130 to 160 feet in width.

Directions.—The channel is so well marked that it is possible to navigate it in clear nights as the balls, surmounting the red dolphins, would then be quite visible. At a cutting near Schlutuper Bay and from the lower part of the cutting, at the bridge, to Lübeck the speed must not exceed 6½ knots, also steam vessels meeting must slow down and, if going in the same direction, they must not attempt to pass each other.

A steamer passing a sailing vessel going in the same direction should, by blasts on the steam whistle or other means, give notice that it is intended to do so.

Where the river has towpaths, beacons are placed along it at distances of 1 kilometer from one another by which vessels can regulate the speed.

Vessels approaching the bridge must give a signal to open it when near around dolphins on each side of the channel, nearly 800 yards from it, which have "Signal" on them or by night display a fixed white lantern light on the starboard, and a fixed red light on the port hand.

The signal to be given is three long blasts each of 6 seconds' duration on the steam whistle.

When the bridge is closed a red ball by day or a red light by night, is shown from its southwest pillar at a height of 10 feet, and directly vessels can pass through these are removed.

For some reason should a vessel be delayed in passing through, a red flag is waved by day or a red lantern light by night, and, in such a case, it may be necessary for the vessel to make fast to the dolphins or to remain underway.

Lübeck Harbor, commencing at Schneider Ferry, continues as the lower harbor to Struck Ferry, a space 1.3 miles in length and from 90 to 270 yards in breadth, and above it it is divided into the inner harbor 1,700 yards in length and from 80 to 130 yards in width, reaching to Holstenbrüche, and the outer harbor, reaching to Puppenbrüche, which is 1 mile in length, and is in course of being increased to an extreme breadth of 80 yards. It is intended that Lübeck Harbor should have a depth of 27½ feet.

Above Holstenbrüche is the harbor for river steamers, and the entrance to the Kanal Harbor from the sea harbor is near the Burgtor. The Kanal Harbor is 1,100 yards in length and 100 yards in width, and has depths of from 11 to 15 feet, besides which there are other harbors.

There is about 2¼ miles of quayage, with a depth of 24 feet alongside in places, and direct communication between vessels and the railway.

Vessels can be supplied with electric light from the harbor, the charge made for the same being in proportion to the length of cable required and the number of lights used.

Compasses can be compensated and a table of deviation obtained from the Sea Observatory, also any information required regarding navigation, as books and charts are kept. Chronometers can be compared at the navigation school.

Storm signals are shown from a flagstaff near the goods department, where is a box containing weather reports. See. Chap. I.)

Town.—The town of Lübeck, situated on the right bank of the Trave, at about 11½ miles from its mouth, has a population of 113,000. The United States is represented by a consular agent.

Communication.—There are daily steamers to and from Malmo, via Copenhagen, during the summer months, also regular steamers to harbors of the Lower Rhine, and steamer services to Kiel, Neustadt, Heiligenhafen, Fehmarn, Stettin, calling at intermediate ports, Christiania, St. Petersburg, etc., and all parts of Germany may be reached by railway.

Elbe-Trave Canal.—Lubeck is connected with the Elbe at Lauenburg by a canal, about 42 miles in length, the sill having a breadth of from 65 to 72 feet and a breadth of 262 feet where it joint Lübeck Kanal Harbor.

It has seven locks, each 262 feet in length and from 39 to 56 feet in breadth, the depths being from 8 to 10 feet. The breadth of the bridge openings is 90 feet, the height 15 feet, and the sharpest curve has a radius of 650 yards. In 1910 a least depth of 5½ feet was reported in the canal.

Coal and supplies.—About 14,000 tons of coal are kept in stock. and nearly 200,000 tons imported annually; coaling is carried on by

baskets, and there are a large number of lighters, some of which are kept loaded, also several tugs are available. Coal wharves, from 70 to 170 feet in length, have depths of from 16 to 20 feet alongside, and about 300 tons of coal could be put on board in 24 hours. About 50,000 gallons of oil can be stored.

Fresh meat, bread, and vegetables may be obtained, and water from the town water pipes is laid on the quays.

Docks:

Name.	Length.		Breadth of entrance.	Depth at H. W. O. S.		Lifting power.	Date built.	Remarks.
	On blocks.	Over all.		On sill.	On blocks.			
Lübeck floating.....	278	278	59½	17½	.....	3,000	1911	Vessels of 6,500 tons and 20 foot draft can be docked.
Henry Koch [floating dock].	139 / 139	.....	64	.....	.....	3,200	.....	

Repairs.—The Henry Koch shipyard can undertake all kinds of repairs, and there are three other yards. Electric and floating cranes will lift 40 tons, and there are a number of others.

Trade.—The principal exports are iron and ironware, coffee, artificial manures, salt, sugar, raw and refined, machines, cotton, fruit, paper, and cardboard, and the imports, wood, coal, woodenwares, eggs, skins and hides, fish, cheese, butter, pulse, and wood pulp.

Herrenwiek Harbor.—At Herrenwiek, about 5½ miles above Travemünde, on the left bank of the river, is a narrow harbor, about 500 yards in length, and with a depth of 24 feet, which is in connection with blast-furnace works; it is marked by beacons and dolphins.

Pötenitzer Bay, within the entrance to the river, on the east side, is a space with depths of from 20 to 26 feet, with a narrow channel leading to it from the river with a least depth of 8 feet.

Dassower Sea, entered by a canal, about 600 yards in breadth, and with about 4 feet, which leads from the southeast side of Pötenitzer Bay, is about 1½ miles in length, and at its east end is Dassow Village.

Measured mile.—In the river, southwest of Stülper Point, is a measured mile, marked by two pairs of beacons on the northwest bank; the direction of the mile is 54° and 234°, but there are no beacons in transit, as a running mark.

Swinging pile.—In Great Holz Bay, southward of the southwest beacons of the measured mile, is a pile to which vessels can secure to ascertain the compass errors. Within a circle, the radius being 130 yards from the pile, the depths are not less than 23 feet, and

from the center of the pile the bearings and distances of the following objects are:

Two beacons on Teerhof Island, with triangular topmarks, which, when in line, form an hourglass shape, give a 268° 30′ bearing in the river.

Schluptup Church, 245° 30′, distant 1¾ miles.

Center of Marien Church (Lübeck), 249° 30′, distant 6 miles.

Volksdorf Mill, 42° 30′, distant 3.1 miles.

Coast.—From Priwall Peninsula to Rosenhagen, 2 miles eastward, the coast is low, but between the latter and Great Klütz Head, 9 miles in a west-northwest direction, it is hilly, and mostly steep toward the sea.

Besides Pötenitz Castle, the other conspicuous landmarks are Kalkhorst, Elmenhorst, and Klütz Churches, and Elmenhorst and Rethwisch Mills, both standing on high ground. The coast bank has a fairly uniform breadth of nearly 800 yards.

Anchorage may be obtained, in a depth of 5 fathoms, on any part of this coast.

Wismar Bay, extending from Great Klütz Head to the northwest point of Wustrow Peninsula, is encumbered with shoals, extending a considerable distance seaward, through which are several channels leading to Wismar.

West side.—Boltenhagen Bay, situated immediately eastward of Great Klütz Head, is nearly 1½ miles in width between the 5-fathom contour lines and recedes about 2 miles to the southward; the coast, on its west side, is steep seaward, and the coast bank is narrow.

Wohlenberg Bay is separated from the southeast side of Boltenhagen Bay by Lieps, a shoal about ½ mile in width, extending for 2¼ miles northeast to Tarnewitz Point, the dividing point between the bays, and then about 1½ miles southeast, with an islet on its extreme.

The bay, almost circular, with a diameter of about 2 miles, outside the shore bank, has a fairly even bottom, the depths being from 3¾ to 5 fathoms, and affords sheltered anchorage, with good holding ground; the land around the bay is moderately elevated.

Hohenwieschendorf Point, the east point of Wohlenberg Bay, is high, and from it a rocky reef extends, within a depth of 3 fathoms, for 1,600 yards.

Coast.—From Hohenwieschendorf Point the coast, trending in a southeast direction for 5½ miles to Wismar, becomes flatter and forms three bays.

The coast bank extends nearly 1 mile off the first half of the distance, and then stretches across and joins the coast bank from Poel, the dredged channel to Wismar passing through it.

Hannibal is a continuation, to the northeastward, of Lieps, the whole being a sand bank, extending 7 miles northeastward of Tarnewitz Point, within a depth of 3 fathoms. Lieps, which has been already mentioned, has depths under 3 feet on its inner part, but that portion of the shoal which extends southeastward dries in places.

The extreme of Lieps is about 3¼ miles from Tarnewitz Point, from which a narrow neck of shoal connects with Hannibal, and over this neck is a channel named Offen Deep.

Northward of the 3-fathom contour line of Hannibal a bank, with depths under 5 fathoms, extends about 1¼ miles, and outside it, to the northward, are detached patches of 4¾ and 5 fathoms.

Buoys.—The buoys marking Offen Deep and Great Deep will be described with those channels.

The western part of the north side of Hannibal is marked by a white spar buoy, surmounted by a staff and upturned broom over two triangles, pointing upward, and having "Hannibal N" on it.

The northern side of the eastern part is marked by a similar buoy, with the exception that it has no upturned broom.

The remaining buoys marking this shoal are given with the buoyage of Great Deep.

The reef extending northward from Hohenwieschendorf Point is marked by a red spar buoy, marked "G," with letter "G" over a ball as top mark.

Schweinsköthel, a shoal about ⅔ mile in extent and with a least depth of 1½ fathoms, lies about ⅓ mile eastward of the 3-fathom contour line of the northern part of Lieps.

Sechers Ground, with a least depth of 2¼ fathoms, is situated from 200 to 400 yards off the east side of the southeast point of Lieps, and is about 1,200 yards in length in a north and south direction, and narrow.

Fliemstorf Point, about 3 miles northwest of Wismar, and on the west side of the dredged channel to that place, has a conspicuous tree on it.

Stegort is a shoal extending ¾ mile northward of Fliemstorf Point, with a depth of 1 fathom at its extreme, and Golwitz is the shoal, with depths under 3 fathoms, extending about 400 yards northward of Stegort.

East side.—Wustrow Peninsula, joined to the high steep shore near Old Gaarz by a low sandy isthmus, extends from that in a southwest direction for a distance of 4 miles, with a breadth of about 1 mile, and at its southwest end forms two points with the Kroy, a bay, between them.

Between Wustrow Peninsula and the coast is Salt Haff, a shallow inlet, with depths of from 1¾ to 2 fathoms in its southern part, which

is entered between Kieler, the southwest point of Wustrow Peninsula, and Werder, a small peninsula on the south side; from Werder the coast trends in a south-southwest direction for 8 miles to Wismar.

The principal landmarks in the bay are Hohenwieschendorf Church, Proseken, and Wismar Churches; the high tree on Fliemstorf Point; and on Poel Island, Timmendorf Lighthouse, with the beacons, lifeboat, and store sheds; Niendorf Mill, and Kirchdorf Church; and on the east coast, Stove Mill and Dreveskirchen Church.

Wustrow Reef.—On the northwest side of Wustrow Peninsula, the rocky shore bank only extends about 300 yards off, but from that southwestward it gradually increases its distance from the shore, and off the southwest point it extends under the name of Wustrow Reef for 1¼ miles westward, the 5-fathom contour line being a similar distance farther west.

Buoy.—A black beacon buoy, marked "Wismar 1," with figure "1" over a ball as top mark, is moored near the 5-fathom edge of Wustrow Reef.

Poel, an island occupying the eastern half of the bay, is nearly 5 miles in length in an east-northeast and opposite direction, with a greatest breadth of 3½ miles; it is fertile, without woods, and flat, except a few slight elevations in the northern part.

On the south side Kirch Bay extends for 2½ miles in a northerly direction into the island to Kirchdorf Village.

Light.—Timmendorf Lighthouse, on the west point of the island, is a cylindrical white tower, 43 feet in height, with a black dome; it exhibits, at an elevation of 60 feet above high water, a fixed light with white, red, and green sectors, visible 12 miles. (For sectors, see Light List.)

Beacons.—There are four beacons on the western part of the island.

The northwest beacon, named Kreienboom, about 1 mile in that direction from Kirchdorf, is iron, 35 feet in height, and has a five-sided top mark.

The southwest beacon, at the southwest beach of the island, is a wooden pyramid, 69 feet in height, surmounted by a cross, the upper part consisting of laths.

The other two beacons, which are for use in leading through a part of the dredged channel to Wismar, stand about ⅝ mile north-northeast and east-southeast of the southwest beacon.

The northern is 30 feet high, and surmounted by a cross; the southern, 46 feet high, has a ball for a top mark.

Storm signals are shown from a mast about 50 yards northwestward of the lighthouse. (See Chapter I.)

Life-saving station.—A lifeboat is stationed on the island, its shed, a large building standing on the beach, is about 800 yards

northeast of the lighthouse, and between is a shed for storing gear; both of these have been mentioned as forming marks.

Dangers.—The island is surrounded by coast banks, which, on the east connect with the coast, while on the south the bank joins that from the shore on the east side of the dredged channel.

Jäkelberg is the extension of the shore bank on the north side, which stretches northeastward, with depths under 3 fathoms, its end being 1¾ miles northward of the island; the 5-fathom contour line, about 1½ miles farther north, joins that on the north side of Hannibal.

Tonnenhaken extends for nearly ¾ mile from the coast of the island northward of the lighthouse; it is rocky and nearly dry.

Die Platte, of irregular shape, and 1 mile in length in a north and south direction, within a depth of 3 fathoms, has a least depth of 1½ fathoms over it, and lies immediately westward of Tonnenhaken.

Middle Ground, a shoal 600 yards east and west, and 400 yards north and south, and with a depth of 2¼ fathoms, lies nearly in midchannel 1.3 miles westward of Timmendorf Lighthouse.

Buoys.—The northwest side of Die Platte is marked by a conical black buoy, marked "5," surmounted by a ball and horizontal crosspiece, and has as top mark the figure "5."

The southwest side of the same shoal is marked by a conical black buoy, surmounted by a staff and ball.

The northeast side of Middle Ground is marked by a red can buoy, with the inscription "M. Gr."

Drei Berge is a patch of 2¾ fathoms lying between Die Platte and Middle Ground.

Walfisch Island, small, and about 600 yards in length, in the direction of the dredged channel, lies near the northwest extreme of the shore bank, which forms the east side of that channel, and is surrounded by shoals with rocks extending ½ mile north-northeast of its north end.

Light.—On the north end of the island is a beacon, 47 feet in height, with a roofed top shaped like a cube; it exhibits, between August 1 and April 1, at an elevation of 59 feet, an occulting white fishing light, visible 4 miles.

Fixed red leading lights, which should be seen from 4 miles, lead through the dredged channel to Wismar, and a fixed green light is shown on the mole.

Channels.—There are two channels of approach to Wismar: Offen Deep, the western, being over the neck of the shoal which connects Lieps and Hannibal, and Great Deep, the eastern, entered between the northeast extreme of Hannibal and Wustrow Reef; the

distances through the bay to Wismar by these channels are 10 and 13 miles, respectively.

Both entrances lead to Kraken Deep, which is the channel between Hannibal on the north, and Tonnenhaken, Die Platte, and Schweinsköthel on the south, and from Kraken Deep the main channel leads between Schweinsköthel and Sechers Ground on the west and Die Platte on the east.

Flagg Deep, between Tonnenhaken and Die Platte, is a narrow channel only suitable for small craft.

Middle Ground may be passed on either side, and from it the channel lies between the southwest point of Poel and Fliemstorf Point; thence toward Walfisch Island to the entrance to the dredged channel, which is about 3¼ miles in length in a south-southeast direction.

Depths.—The least depth in Offen Deep is 2½ fathoms, and in Great Deep 4¾ fathoms, and from Kraken Deep to the east buoy of Stegort the least water is 3½ fathoms.

The Flagg Deep has a depth of 2½ fathoms, and the channel to Wismar is dredged to a depth of 19 feet. The bottom in the last channel being slime, stem vessels drawing nearly the same as the depth can pass through.

Buoyage.—A black beacon buoy, surmounted by a staff and ball, is the fairway buoy for Offen Deep, and has "Wismar Offen Tief" marked on it.

The northern end of Lieps is marked by a white buoy with north top mark (two triangles, points upward) situated about 1,400 yards southwestward of Wismar Offen Tief Buoy.

A red beacon buoy, surmounted by two balls, and with "Wismar Gross Tief" on it, serves as a fairway buoy for Great Deep and also marks the northeast spur of Hannibal.

Southwestward of the fairway buoy, on the starboard side of the channel, are three red spar buoys marked "A," "B," and "C," respectively, each surmounted by a ball, above which are the letters "A," "B," and "C," respectively.

Off the south side of Hannibal Bank is a similar buoy marked "D" and with letter "D" as a top mark.

On the east side of the channel, within the black beacon buoy marking Wustrow Reef, is a conical black buoy surmounted by a down-turned broom and the figure "2" and marked "2." Southwest of this buoy is a similar buoy marked "3," with figure "3" above the broom top mark.

In Kraken Deep, northwestward of the entrance to Flagg Deep, is a black beacon marked "4," with figure "4" over two balls as top mark. This buoy is moored northward of Die Platte.

The remaining buoys in the bucht and in the dredged channel are in accordance with the German system, the starboard-hand buoys

being each marked with a letter and carrying that letter as a top mark, and the port-hand buoys being each marked with a number and carrying that number as a top mark.

Flagg Deep is marked at the southern end by a red beacon buoy, marked "Flag Tief," with two balls as top mark.

Wismar Harbor consists of an old, a new, and a west harbor, the first 550 yards in length and from 130 to 160 feet in width, with quays 1,300 yards in length on its east side communicating with the railway; the depth in this harbor is 3¼ fathoms.

The new harbor, situated northeastward of the old one, has a separate entrance, and the railway runs on its quays, which are on the east side; the depth is 3¼ fathoms. The west harbor is westward of the others. With strong southerly winds the depths may be from 1½ to 2½ feet less.

Buoyage.—The dredged channel is buoyed in accordance with the German system. (See Chapter I.)

Anchorages.—The outer anchorage is northward of an imaginary line joining the southwest beacon on Poel and Hohenwieschendorf Point and between it and Middle Ground and Die Platte, the best berth being in depths of from 4¼ to 4¾ fathoms, over ooze and sandy bottom, ½ mile outside Gross Kamrad Shoal, off the west side of Poel.

The inner anchorage is southward of the above line, the best berth being in from 3¼ to 3¾ fathoms water, over ooze and sand, between Stegort and the southern of the leading beacons on Poel.

Pilots.—A head pilot and two under pilots are stationed near Timmendorf Lighthouse, and pilot vessels from sea to the anchorages or to Wismar, boarding vessels from sailing or rowing boats as far out as Hannibal, the boats carrying a red and white horizontally striped flag, with a white anchor on a blue field in the left top corner; it is only during sever northeast gales that they are occasionally prevented from boarding vessels. Pilotage is not compulsory.

Directions—Offen Deep.—Although the shoals in the bay are dangerous, they may generally be approached by the lead, and for marks, the towers at Wismar, and the high Marien Church, can be seen from a considerable distance.

Nicolaus Church, midway between the southwest beacon on Poel, and Marien Church, bearing about 145°, leads to the fairway buoy, and when it and the black buoy No. 5 on the northwestern side of Die Platte are passed steer about 155°, with the tree on Fliemstorf Point a little on the port bow, which should lead between the buoy marking Schweinsköthel and those westward of Die Platte, and when abreast of black buoy No. 8 alter course to 133°.

This latter course should take a vessel to the eastward of the buoy marking the east edge of Stegort, and, steering westward of the outer buoy (black with ball), the two beacons on Poel should come in

line, 340°, when steer 160°, with them as a stern mark, until Proseken Church is in line with the southern building at Hoben, 233°, after which the channel must be navigated by the buoys.

If intending to anchor in Wohlenberg Bay, when steering 155° from Fliemstorf Point, alter course for Hohenkirchen Church, when it bears 192°, and on the dry extreme of Lieps coming abeam, steer in mid-channel into the bay.

A large barn, near Brandenhusen, in line with the southwest beacon on Poel, about 95°, leads northward of the reef extending northward of Hohenwieschendorf.

Great Deep.—Marien Church, at Wismar, in line with the mill on Poel, bearing about 175°, leads over the outer part of the shoal extending northeast of Hannibal in a depth of 4¼ fathoms.

Deeper water will be obtained with Marien Church in line with Niendorf Mill on Poel, which leads in depths of from 6 to 8 fathoms to the entrance to Great Deep, until Alt Gaarz Church comes in line with the high northwest shore of Wustrow Peninsula, 72°, when alter course to about 146° for Dreveskirchen Church, for about 1¼ miles or until Timmendorf Light Tower bears 215°.

From the latter position steer 229°, until the northwest beacon and church on Poel are in line, 124°, when the course should be altered to 271°, between the buoy marking the southwest end of Hannibal and the black beacon buoy No. 4, and until the tree on Fliemstorf Point bears 153°, when follow the buoyed channel.

No marks are available for Flagg Deep, which must be navigated by the buoys.

By night.—If Timmendorf Light is seen it may be approached, bearing 206°, which will lead in depths of from 3¾ to 4¾ fathoms over the extreme east end of Hannibal, which will be passed on an increase of depth, and when in 6 fathoms it would be advisable to anchor, this position being only dangerous during heavy gales from north or northeast.

Storm signals are shown from a mast on Poel. (See Chapter I.)

Current.—The current, which is weak, is only appreciable in the deepest channels, during continuous winds for one quarter. With winds from north to east it sets in a westerly direction outside Timmendorf, and to the southward inside that point, and with winds between south and west, it sets in the reverse directions.

Ice forms much earlier in the channel to Wismar than in the western part of the Baltic, and the harbor is generally closed sooner than Travemünde or Warnemünde, although the channel is kept open as long as possible by the ice breaker.

Town.—Wismar, a town with about 24,000 inhabitants, is situated on the inner part of the bay.

Communication.—Wismar is a station on the railway between Lübeck and Stettin, and has also railway communication with the interior of Mecklenburg; there is a post and telegraph office.

Coal and supplies.—About 5,000 tons of coal are kept in stock. Supplies of fresh provisions may be procured, and water is brought on board by hose.

Repairs.—A shipbuilding yard can execute all kinds of repairs to wooden vessels, and small repairs to iron vessels and machinery might be effected; a steam and a fixed crane are available.

Hospital.—There is a garrison hospital in the town.

Trade.—The principal exports are sugar, salt, and grain, and imports coal, wood, granite, and chalk stones.

Coast.—From the low sandy isthmus that connects Wustrow Peninsula, the coast trends northeastward for 4 miles to Buk Point, and then turns eastward for 5¾ miles to Heiligendamm; the land is high in the interior, but the hills do not approach the coast, although the latter is steep in places.

From Heiligendamm the coast has still an easterly direction, for 9 miles, to Warnemünde, and between the elevations become greater, but on the stretch to Heiligendamm there are more woods than in the latter part.

Alt Gaarz Church is situated near the coast northeast of the isthmus, and Buk Point Lighthouse, Fulgen farm, near the shore, midway between it and Heiligendamm, Jennewitz Mill, and the houses at Heiligendamm, are all conspicuous; the latter are white, and show over the trees surrounding them.

Farther eastward are Steffenshagen and Doberan Churches, the latter especially conspicuous, having a slender spire which can be seen from all directions; Warnemünde Lighthouse and Church are also marks.

Light.—On a conical hill, 1½ miles southward of Buk Point is a cylindrical red tower, 68 feet in height, with a dark-colored dome; it exhibits at an elevation of 312 feet above high water a flashing white and red light, the white light visible 17 miles and the red light 14 miles. (For bearings see Light List.)

Signal station.—Near the lighthouse is a State signal station with a telephone; this station is always open. (See Chapter I.)

Life-saving stations.—Lifeboats are stationed at Arendsee, about 1½ miles eastward of Buk Point, and at Heiligendamm, and a rocket apparatus is maintained at each place.

Shore bank.—From Buk Point the shore bank is nowhere more than about 600 yards in breadth, until approaching Warnemünde, and about 1½ miles westward of that place it increases its distance to about ½ mile, which it continues to about the same distance eastward of Warnemünde.

Trolle Ground is a bank about 1¾ miles in breadth, fronting Buk Point and extending 1.3 miles offshore, within the depth of 5 fathoms.

Warnemunde.—Warnemunde Harbor, at its entrance, is formed by three piers, extending in a northerly direction, the western being about 550 yards in length. The middle pier extends nearly 400 yards northward from the west end of a piece of land which forms the east side of the Old Warnow, or the old stream, this land being joined by a dam at its southern end to the south part of the town.

The New Warnow, or the new stream, passes eastward of the middle pier and the block of land, and is protected on its east side by the east pier, which extends nearly 1,200 yards northward; above New Warnow the harbor bifurcates, forming the harbor basin on the west and the channel to Rostock on the east side.

The outer harbor is 600 yards in length from the pierhead inward and about 250 yards in width at its inner part, where are the steam ferry berths. The Old Warnow is 1,350 yards in length, but is crossed by a swing bridge at 900 yards, the width of this part being about 150 feet.

The New Warnow is about 800 yards in length and 200 feet in width, and southward of it is the turning basin, 400 yards in length and 270 yards in width, in which vessels of 16-feet draft can turn, with a radius of over 100 yards. The harbor basin is 900 yards in length with a breadth of 100 yards, and the entire length of quayage for the whole harbor is 1⅓ miles, one-third of which is provided with railway and crane lines.

Lights.—On the west side of the entrance, about ¼ mile within the west pierhead, is a cylindrical white tower, 32 feet in height, with two galleries, a red stripe round the lower part; it exhibits, at an elevation of 112 feet above high water, a fixed white and group flashing light visible 16 miles.

Fog signal.—A gun, at the bend of the west pier, is fired twice in quick succession, every two minutes, and a bell rung continuously when vessels' signals are heard.

West Pier.—A fixed green electric light is exhibited, at an elevation of 33 feet above high water, from a red iron framework, 36 feet in height, surmounted by a ball, which is situated on the head of the extension of the west pier; it is visible 2 miles, but is liable to be washed away in heavy on-shore gales.

If this light should be extinguished a fixed green light above a fixed white light will be shown from the old head of the west pier.

East Pier.—On the east pierhead is a cylindrical tower, 43 feet in height, painted white above and black below, and surmounted by a barrel. It exhibits, at an elevation of 33 feet above high water, a fixed red electric light, visible 3 miles but it is not shown when the

keeper is prevented from reaching the pierhead on account of the weather, nor when the harbor is obstructed by ice.

Central Pier.—A flashing orange-colored electric light is exhibited, at an elevation of 24 feet above high water, from a red tower with white band, 34 feet in height, and is visible 3 miles.

Old Warnow.—On each side of Old Warnow fixed orange-colored electric lights are shown from black iron lattice beacons at an elevation of 43 feet above high water, and visible 3 miles. They are each used in combination with the central pier light as leading lights, but are not shown when the harbor is obstructed by ice.

Ferry lights.—A fixed green light is shown at the head of the eastern ferry berth, and 15 minutes before the arrival of the ferry steamer a fixed white light is shown at the western ferry berth, and two fixed white lights placed vertically, and two dark orange-colored leading lights lead to the middle landing. The eastern and western ferry berth lights are shown from black skeleton beacons.

Signal station.—There is a State signal station, which has telegraphic communication. The mast stands near the lighthouse. (See Chapter I.)

Storm signals are made from the signal mast, and a box containing the latest weather information and telegrams is at the harbor office. (For signals see Chapter I.)

Life-saving stations.—A lifeboat is stationed on the east bank of Old Warnow, and another on the shore eastward of New Warnow.

Submarine telegraph cable.—A cable to Gjedser crosses the river, and a beacon, which in line with Warnemünde Church points out its direction, stands on the shore, westward of the lighthouse.

Depths.—The depth on the bar at the entrance is 21 feet, but may be reduced by northwest gales.

The outer harbor has everywhere a depth of 18 feet; the average depth in Old Warnow is 17 feet, with from 10 to 16 feet alongside the quays; the New Warnow has a depth of 21 feet, and vessels of that draft can lie alongside.

The turning basin, as already mentioned, allows vessels with a draft of 16 feet to turn, and there is a similar depth in the harbor basin.

Beacon.—A "Winkbake" or signal beacon is situated on the west pier, and carries the Mecklenburg flag.

Anchorage.—The best anchorage is in a depth of 5¼ fathoms. over good holding ground, to the northward of the lighthouse, with Schröders Ort, a wooded projection of the coast, well open northward of Stoltera, bearing 248°, but there is no shelter from winds between north and northeast.

Pilots.—Pilotage is compulsory, and in addition to a head pilot there are 8 sea pilots, who come out as far as the anchorage in sailing or rowing boats, flying the Imperial flag.

Tugs.—Passenger steamers, plying between Warnemünde and Rostock perform towage work.

Directions.—The channel is subject to alteration from silting, but it is deepened by dredging with as little delay as possible. In 1911 the leading marks for entering were the red disks on the black lattice beacons on the west or east side of Old Warnow in line with the red disks surmounting the red and white tower on the central pier, bearing 174° and 185°, respectively.

Should the weather prevent a pilot from gong out, a vessel might enter by following the directions given by the "Winkbake" as given at Travemünde.

The depth of the water on the bar is signaled from the signal staff at the lighthouse, by the International Code, and 10 knots is a good speed for entering, but with a heavy following sea that speed might require to be temporarily increased.

On the west side are two capstans with hawsers and men ready to assist a vessel entering, in the event of getting into any difficulty.

When a vessel is leaving the harbor at the time another is about to enter, the fact is signaled to the incoming vessel from the mast from which storm signals are made, by two German flags by day, or two lantern lights, placed vertically, by night, and when these signals are shown, no vessel should attempt to enter.

Current.—The current on the coast off the entrance is west going with winds from north, through east, to south-southeast, and east going with winds from south to north-northwest; the greatest velocity of the latter observed is 3 knots.

If an offshore wind sets in suddenly after a prevalence on onshore winds, the current runs strongly out of the river, and an in-going current is the result of reversed conditions. The greatest rate of the outgoing stream, which sets strongly on to the east pier, is 5¼ knots; the in-going stream sets round the east pier, and obliquely across the harbor from the head of the west pier.

Current signals.—For the information of the ferry steamers, current signals are made previous to their arival, from a disk having a pointer, and situated on the projection between the ferry berths; the pointer is shown on the eastern half of the disk for an in-going stream and on the western half for an outgoing one, and the signals are as follows:

Pointing directly downward.—No current.

Pointing obliquely downward.—A weak current.

Pointing diagonally sideways.—A strong current.

Pointing obliquely upward.—A very strong current.

By night the pointer has three fixed white lights, one in the center and the other two on the upper and lower edges of the disk, respectively, so that they are vertical with no current running, and if a current exists the lower light is moved to the side of the other two to represent the day signals.

Ice.—The harbor is free from ice longer than Travemünde, Wismar, and the harbors to the eastward on the German Baltic coast, as the mouth of the river seldon freezes over, and if it does so it is only for a short period, and the rising water breaks up the ice, which is taken away by the current.

Mail steamers running to Gjedser only discontinue the service in exceptionally severe winters, and in 1895–96 this occurred for 21 days, while in 1897–98 they were prevented from running for 18 days.

If the entrance is barred by ice, neither the east and west pier lights nor the leading lights are shown, and by day the beacons do not display disks. (See Average ice conditions, Appendix.)

Town.—Warnemünde, on the left bank, at the mouth of the Warnow, has about 4,200 inhabitants and is of some importance, as the traffic between Berlin and Copenhagen passes through the port. Trains from Berlin and Hamburg, arriving at the ferry harbor, are taken on board the ferry and the crossing to the ferry harbor on the south of Falster occupies about 1¾ hours, from which the trains proceed by rail and ferries to Copenhagen.

There is a post and a telegraph office in the town.

Coal and supplies.—About 700 tons of coal are kept in stock, and water can be obtained from pipes at the quays. Two steam cranes each lift 15 tons.

A salvage steamer and three sets of diving apparatus are available.

Warnow River.—The Warnow River to Rostock, a distance of about 6½ miles from the mouth, is known as the Unter Warnow, and above that town as the Ober Warnow, the two parts being separated by a sluice, or lock, 169 feet in length, 22⅝ feet extreme breadth, and with a depth of 8¾ feet.

The Unter Warnow has a depth of 16¼ feet and can be navigated by vessels drawing 15½ feet. The Ober Warnow has a least depth of 13 feet as far as Butzow and can be navigated to that place by vessels 130 feet in length. It is proposed to increase the depth in the Unter Warnow to 17 feet.

Buoyage.—The river is marked by dolphins and floating beacons, the former being red and surmounted by a staff on the starboard hand and black on the port, and white lantern lights are also shown at a part of the channel.

The Breitling is a shallow lake, or widening of the Unter Warnow, situated within the right bank, about 1 mile southeast of the river entrance; a channel through it to a farm on the east shore has a depth of 5 feet, and is buoyed.

Leading lights.—On the east side of the turning basin are two white poles, 37 and 25 feet in height, and 130 yards apart, which exhibit, at elevations of 27 and 17 feet, respectively, above the river, two fixed red leading lights, visible 5 miles, which, when in line, bearing 184°, lead from the turning basin to the cutting near The Breitling.

Three fixed white leading lights are shown in the channel between Warnemünde and Rostöck, between August 15 and September 15.

Pilots.—There are four pilots for the river.

Ice.—The river between Warnemünde and Rostock freezes more easily than at the mouth, and is unnavigable on an average for 60 days every year from ice.

Rostock Harbor, on the left bank of the river, has a quay 1,750 yards in length, on which the railway lines run, the depths alongside being about 16 feet.

Rostock, about 6¼ miles from the river mouth, is the largest commercial town in Mecklenburg, and has a population of 70,000; a British Vice Consul is resident.

Communication.—Regular steamship communication is maintained with Lübeck, Wismar, Stralsund, Stettin, and Gjedser, with Copenhagen, via Mlmö, and with Hamburg, via the Kaiser Wilhelm Canal. There is railway communication with the whole of Germany, and a post and telegraph office in the town.

Coal and supplies.—About 6,000 tons of coal are kept in stock, and 150,000 tons imported annually. Coaling is carried on by baskets, it being possible to load 250 tons in 24 hours; there are about 10 lighters, holding from 50 to 150 tons, also a coal wharf with a depth of 15½ feet alongside.

Fresh provisions may be obtained, and water from the town supply.

Dock and patent slip.—There is a floating dock, 270 feet in length, on blocks; 58 feet wide at entrance; 17 feet depth on sill at H. W. O. S. and lifting capacity of 3,000 tons. There is also a patent slip 233 feet in length; with depth at H. W. O. S. forward 7 feet, and aft 14 feet, and it will take a vessel of 800 tons register.

Repairs.—The shipyard has an engine factory, and repairs to machinery could be undertaken; a steam floating crane will lift 25 tons, and a fixed crane 80 tons, and divers can be obtained.

Hospital.—A garrison hospital is in the town.

Chronometers can be rated at the Navigation School, and compasses are adjusted by the Sea Observatory.

Storm signals are made from a mast near the Grapiengieszer Tor, and at it weather boxes, with telegrams respecting the weather, are kept, as well as at other parts of the town. (See Chapter I.)

Deviation beacon.—There is a deviation beacon in the harbor from which the bearings of the objects mentioned are as follows:

Dierkower mill, 40° 30′.

Factory chimney, Karlshof, 82° 30′.

Chemical factory chimney at Bramow, 298° 30′.

From a dolphin near Neptune Yard are the following bearings:

Petri tower, 106° 30′.

Nicolai tower (Rostock), 114° 30′.

Trade.—The chief export is grain. The imports are foodstuffs, coal, wood, raw sugar, and granite.

Coast.—From Warnemünde the coast, trending in a northeast direction, for about 23 miles, to Darsser Ort, is wooded almost everywhere, except on Fischland, and sand hills and moderate elevations of the land alternate, coming close to the coast.

Besides the churches at Warnemünde and Rostock, those at Ribnitz, Dierhagen, and Wustrow are also conspicuous, and Bogislav, a bathing hotel situated to the northward of Ahrenshoop village, forms a good mark, while farther northeast is Darsser Ort Lighthouse.

Depths offshore.—The depths offshore are irregular, but the coast is fairly clean. The shore bank, to the 3-fathom contour line, extends nearly 1 mile off the coast at Ribnitzer Forst, and 1¼ miles west-northwest of Heide Ort is a patch of 3 fathoms.

The 5-fathom contour line is about 3 miles off the coast as far as Fischland, but within 5 miles of Darsser Ort it closes the coast to a mile; there are patches of 4½ and 4¾ fathoms outside it.

Vessels of deep draft should keep at least 3 miles of this coast.

Fischland, commencing about 11 miles northeastward of Warnemünde, is a strip of lowland, from ¼ to 1½ miles in width, separating Saaler Bodden, an inland sheet of water, nearly 10 miles in length and 5 miles in greatest width, from the sea, and about the middle of Fischland is Wustrow village, with about 1,100 inhabitants.

Anchorage.—Good anchorage may be obtained off Wustrow village in from 5½ to 6½ fathoms water, over sand with clay below it.

Light.—On Fischland, about 1½ miles southwest of Wustrow, a fixed white light is exhibited, at an elevation of 36 feet above high water, from a square building on piles, and 29 feet in height to the center of the lantern.

Fog signal.—Near the light structure is a fog siren which gives three blasts, high-low-high, every 30 seconds.

Whistlebuoy.—A conical whistlebuoy, painted in black and white checkers and having a west top mark (two triangles, points together), is moored about 2½ miles northwest of the light structure.

Life-saving station.—A lifeboat is stationed and a rocket apparatus maintained about 1 mile northward of the light structure.

Directions.—Care is necessary when navigating this coast, especially in thick weather, and the use of the lead must on no account be neglected, as it not infrequently happens that after strong winds from southwest, through west and north, to northeast, a current setting out of Fehmarn Sound to the southeastward into Mecklenburg Bay attains a rate of 5 knots.

Under such circumstances there is a danger of being set toward the Mecklenburg coast, and vessels should endeavor to keep in depths of not less than 10 fathoms, which there should be no difficulty in doing by attention to the lead.

A bank southwest of Gjedser Lightvessel has depths under 10 fathoms, but in Cadet Channel, southeast of it, they are from 11 to 15 fathoms, and when in this channel depths under 8 or 9 fathoms generally denote an approach to the Mecklenburg coast, while if less than that the vessel is probably on the side of the Gjedser Lightvessel.

Darsser Ort, turning with a hook to the eastward, is composed of sand hills, the coast from Wustrow being low.

Lights.—About 200 yards within the point is a cylindrical red stone tower 115 feet in height, with a brown dome, which exhibits at an elevation of 108 feet above high water a fixed and flashing white light, visible 16 miles.

Fog signal.—A fog siren will give one blast every 75 seconds, thus: Blast, 7½ seconds; silence, 67½ seconds.

Signal station.—Darsser Ort is a State signal station, with telegraph communication. (See Chapter I.)

Storm signals are shown by means of a red light by night. (See Chapter I.)

Life-saving station.—A rocket apparatus is maintained at Darsser Ort, the shed being near the lihthouse.

Darsser Ort Reef, which is on a large bank with depths under 5 fathoms, extends in an east-northeast direction for nearly 1½ miles from the east point of Darsser Ort, the inner part for about ⅔ mile having dry places on it.

Light and bell buoy.—The northeast side of the reef is marked by a light and bell buoy, painted white, marked "Darsser Ort 0." carrying an East topmark (two triangles, bases together), and exhibiting a flashing red light every 12 seconds, thus: Light, 4 seconds; eclipse, 8 seconds.

Coast.—From Darsser Ort the direction of the coast is about east-southeast, for 13½ miles, to Pramort. It alternates between sand

dunes and pine forests. The most conspicuous objects are Prerow, Zingst, and Barth Churches and Darsser Ort and Dornbusch Lighthouses. This part of the coast is known as the Darss.

The 3-fathoms contour line, which is about half a mile to the southward of Darsser Ort, gradually increases its distance from the coast, and at Pramort it is about 1½ miles. The 5-fathom contour, which is about 5 miles north-northeast of Darsser Ort, closes the shore to 3 miles, and then draws off and in nearly 6 miles northward of Pramont.

Anchorage.—Small vessels can anchor with offshore winds, in a depth of 3¾ fathoms, anywhere along this coast.

Prerow Bank, about 3 miles in length in a north and south direction, with a greatest width of 1 mile, lies about 1 mile within the 5-fathom contour line, its north point being 3½ miles northeast of Darsser Ort; the depths on the bank are from 1¾ to 3 fathoms, over fine sand.

Buoys.—The north extreme of the 5-fathom contour line, which incloses Darsser Ort Reef and Prerow Bank, is marked by a white spar buoy, surmounted by two triangles pointing upward, moored about 1 mile outside a depth of 5 fathoms.

Prerow Bank is marked by three buoys:

On the north and northwest sides are two white can buoys, each surmounted by a staff and two triangles pointing upward; the western is marked "Prerow N. 1," and the eastern "Prerow N. 2."

A white spar buoy, surmounted by two triangles pointing downward, is moored off the southwest edge of the bank, and has "Prerow S" on it.

Plantagenet Ground, lying off the bay formed between Darsser Ort and Dornbusch, including a detached 4-fathom patch southward of it, is 2¾ miles in length in a north and south direction and about 2 miles in width; the least depth on the shoal is 3¾ fathoms.

The bottom, on the shoalest part, is fine sand, and on the remainder speckled sand.

Light and whistle buoy.—A white light and whistle buoy, with a framework superstructure, which has two triangles pointing upward, and "Plantagenet Gr. N." in black letters on it, exhibits an occulting white light, with a period of system of five seconds, showing light three seconds, eclipse two seconds; it is moored off the north side of the shoal.

Prerow is a village with 1,197 inhabitants, situated on the Darss, and within the sand dunes which line the coast; Prerow Ström, the channel leading to the village, has a depth of 7 feet.

Ribnitz, at the southeast end of Saaler Bodden, is a town with a population of 4,482, approached through a dredged channel from

100 to 130 feet in width, with depths of from 7 to 8 feet; there is regular communication by small steam vessels between Wustrow and Ribnitz.

Zingst, a village near the west end of the peninsula of the same name, has 1,355 inhabitants.

Coast.—Off Pramort, at the east end of Zingst Island, are Great and Little Werder Islands, lying on Bock Sand, which stretches in an easterly direction for about 5 miles and dries at low water; about ½ mile eastward of the extreme of Bock Sand is the Gellen, the southern part of Hiddensö Island, which, from its south point, extends nearly 10 miles in a north by northeast direction. Stralsund and Prohn Churches and the various light structures are the most conspicuous objects.

Between the extreme of Bock Sand and the Gellen is the entrance to Gellen Ström, which, continued by Vierendehl Channel and Stralsund Channel, leads to Stralsund.

From the inner part of Gellen Ström a channel runs along the south side of Bock Sand, with Barhöft as its southern entrance point; it leads to the Grabow, a sheet of water southward of Zingst Peninsula, and to Barth.

Depths offshore.—The 3-fathom contour line, which is about 1½ miles northward of the east end of Zingst Island, trends northeastward toward Dornbusch, and northwestward of the entrance to Gellen Ström it is fully 3 miles off, with patches of 2¾ and 3 fathoms outside the 3-fathom line, and 6 miles northward of the east end of Bock Sand.

The 5-fathom contour line follows a somewhat similar direction, being nearly 7 miles outside the same entrance, and outside this contour line are several patches of 4¾ fathoms.

Leading lights—Vierendehl Ground.—Near the middle part of Vierendehl Ground, which extends about 3½ miles southward of the Gellen, are two leading lights, 1,200 yards apart, and in line bearing 174°.

The rear light, exhibited at an elevation of 75 feet above high water, from a red iron tower 65 feet in height, standing on a gray stone base, is fixed white with red sectors, the white light visible 14 miles, showing with full brilliancy for 7° on each side of the leading line, and from that gradually diminishing in intensity. It is unwatched.

The front light, shown from an iron tower 18 feet in height, standing on a gray stone base, at an elevation of 36 feet above high water, is flashing white, visible 11 miles.

Bock Sand.—Two leading lights, shown from structures near the southeast part of Bock Sand, are as follows:

The rear light, exhibited at an elevation of 47 feet above high water, is fixed, with white, red, and green sectors, and is visible 12 miles. The light structure consists of a stone pedestal with a triangular-shaped framework, surmounted by a round lantern with a conical roof, the whole 52 feet in height.

The front light is occulting white. It is shown, at an elevation of 17 feet above high water, from a cylindrical gray masonry beacon 24 feet in height, and is visible 5 miles.

These lights in line, bearing 322°, lead through Vierendehl Channel from No. 1 buoy.

Barhöft.—Two fixed red leading lights, 200 yards apart, and in line, bearing 208°, are shown on the point southward of Barhöft, and in one lead from No. 6 buoy in the Gellen Ström to the anchorage at Barhöft.

The south light is shown, at an elevation of 34 feet above high water, from a red and white striped beacon 30 feet in height.

The north light, at an elevation of 15 feet, is shown from a pole at a shed 14 feet in height, and both lights should be visible in clear weather from a distance of 2 miles.

Light.—On Gellen is a gray cylindrical tower, with a red roof, on a stone base and 27 feet in height, which exhibits, at an elevation of 35 feet above high water, a group occulting light having white, red, and green sectors, and is visible 11 miles.

Beacon.—A white beacon, surmounted by a triangle pointing downward, is situated on the east coast of the island, 108°, distant about 200 yards from Gellen Light Tower.

Buoyage—Bellbuoy.—Near the north extreme of the 3-fathom contour line, extending 6 miles northward of Bock Sand, is a white bellbuoy, surmounted by two triangles pointing upward.

Nearly 3 miles southward of the bellbuoy is the fairway buoy of the channel leading to Gellen Ström, which is a red and black beacon buoy, surmounted by a ball under an upturned broom.

The channel is marked according to the German system. (See Chapter I.)

Depths.—Gellen Ström is kept at a depth of about 13 feet by dredging, but with winds between west and south the depths may be 3 feet less, and with those from east to north 4 feet more, the lowest level occurring frequently.

Anchorage.—The anchorage at Barhöft, in front of the pilot station, is so small that it is necessary to anchor in the middle to avoid tailing on shore; the holding ground is good.

Pilots.—Pilotage is compulsory, and pilots come out sometimes as far as the bellbuoy, the boats carrying the Imperial flag.

Between Barhöft and Barth Pilotage is not compulsory. Small passenger steamers act as tugs.

Directions.—Vessels from the westward should keep at least 5 miles from Darsser Ort, Prerow Bank being passed when Barth Church bears 163°; or a vessel of light draft can round Darsser Ort Reef by passing about 1½ miles off the point, and steer to pass southward of Prerow Bank.

If proceeding through Gellen Ström, when the towers of the churches at Stralsund are seen, Marien Church, the wastern tower, should be steered for, bearing 175°, until the light towers on Vierendehl Ground can be made out, when they should also be brought in line with Marien Church, which leads in the channel between the buoys until the house and pole, exhibiting the lights at Barhöft are in line 208°, which leads to the anchorage.

The fairway buoy of the channel may also be approached by bringing the white beacon, surmounted by a triangle pointing downward, in line with Gellen light tower, bearing 107°.

By night.—Vierendehl leading lights (fixed and flashing white) in line, bearing 174°, lead through Gellen Ström until the two fixed red leading lights at Barhöft come in line 208°.

Barhöft Harbor is small, being only about 50 yards square, with a depth of 7 feet; it is approached by a dredged channel, 700 yards in length, 65 feet in breadth, and with a depth of 7 feet, and marked by perches. Barhöft is the declaration post for Barth and Stralsund. Vessels entering must await at the declaration post the arrival of the customhouse officials.

Storm signals are shown from a mast on the high shore, and about 200 yards northward of it is another signal mast from which water-level signals are made. (For both signals, see Chap. I.)

Life-saving station.—Barhöft is a lifeboat station, and a rocket apparatus is maintained; the boat shed is close to the harbor.

Channels westward of Barhöft.—The channels from Barhöft westward can only be navigated with the assistance of a pilot, or by those having local knowledge. The distances to the various places and the depths in the channels are as follows:

	Miles.	Feet.
Barhöft to Barth	13	10½
Barhöft to Zingst	15	8½
Barhöft to Prerow	21	7½
Barhöft to Damgarten	33	7½
Barhöft to Ribnitz	33	5½
Barhöft to Wustrow	29	4

The channels vary in breadth from 65 feet to 130 feet, and are buoyed in accordance with the German system for inner channels. (See Chap. I.)

Barth Harbor is sheltered by two breakwaters, and a center quay, extending north and south, divides it into an east and west harbor, the former narrow, with from 8 to 11 feet alongside the quay, the

west harbor has from 4 to 11 feet, and there are also small harbors belonging to a sugar factory and a sawmill.

The water rises with winds from northwest through north, to northeast and falls with southwest gales; during severe northeast gales as much as a 7-foot rise has been experienced.

There is no licensed pilot; passenger steamers perform towage, and ice, being broken by the banks, is not dangerous.

Barth, a town with about 7,000 inhabitants, is a station on the railway between Rostock and Starlsund, and has regular communication, by small steamers, with the places in the vicinity; there is a telephone.

About 200 tons of coal are stocked, water can be obtained from wells, and a shipbuilding yard can make repairs to wooden vessels, while very small repairs to machinery might be done at an implement factory.

Stralsund is situated 7½ miles southward of Barhöft, approached through Vierendehl and Starlsund channels, Starlsund and Prohn churches being good marks.

The harbor, situated on the east side of the town, has five approaches, and quays 650 yards in length; the depth in the northern part is 16¼ feet, and in the southern 9¾ feet.

The depth in the dredged channel, 130 feet in breadth, is 16¼ feet, but in spring and autumn there is sometimes a difference of 3 feet in level, gales from northeast causing high, and those from southwest low, water.

Leading lights shown at Stralsund consist of a front light, fixed, with white, red, and green sectors, and shown at an elevation of 16 feet from a gray post 10 feet in height, and a rear light, fixed red, shown at an elevation of 31 feet; both lights should be seen from 2 miles.

Lights are shown in connection with the ferries at Stralsund and Altefähr, and fog signals are made.

Storm signals are shown at the harbor, and a box containing weather reports is kept at the harbor watchhouse. By night storm signals are made by a red lantern light. (See Chapter 1.)

Lifeboat.—Stralsund is a lifeboat station.

Anchorage.—There is good anchorage abreast the town.

Pilots.—A head pilot and five under pilots are stationed at Stral sund, and pilotage for the harbor is compulsory; a pilot will board a vessel making the usual signal.

Anchorage—Submarine cables.—A submarine telegraph cable crosses Stralsund Channel from the northeast side of Danholm, and an electric cable crosses Ziegelgraben (the channel between Danholm and Stralsund) and thence crosses from Danholm to the Rügen shore.

The positions of these cables are indicated by beacons, and the latter cable, in addition, by green spherical buoys; anchorage is prohibited in their vicinity.

Spoil grounds in Stralsund channel are marked by brown barrel buoys.

Harbor regulations.—Special harbor regulations are in force, a printed copy of which should be obtained from the port authority.

Directions.—After passing through Gellen Ström the light beacons on Bock Sand should be brought in line, bearing about 322°, and used as a stern mark, steering 142° from No. 1 buoy leads between the buoys marking Vierendehl Channel.

When the black beacon buoy at the south entrance to the channel is reached, the course should be altered to 153° for the barn near Barnkevitz, until Marien Church is well open eastward of Parower Haken, about 186°, when steer south for the high yellow shore near Altefähr.

When Klein Kedingshagen Mill is in line with a small water mill near Parow, bearing about 246°, the course is more to the westward of south for the fairway buoy of the harbor channel.

Ice.—Stralsund Channel freezes easier than the ports nearer the entrance, and gales between north-northeast and northeast may render the ice dangerous.

Town.—Stralsund, the capital of the district, has a population of about 31,150, and communication by steam vessels with Lübeck, Rostock, Stettin, and Rugen Island, also by railway with all parts of Germany.

Coal and supplies.—About 2,000 tons of English and Westphalian coal are kept in stock; fresh provisions can be obtained, and water from the town supply.

Repairs.—Small repairs to machinery and boilers could be undertaken by the Pommersch Iron Foundry and other firms; a crane will lift 25 tons.

Hospitals.—Seamen are admitted to the town hospital, and there is also a garrison hospital.

Trade.—The chief exports are grain, piece goods, cement, stones, potatoes, and wood, and imports guano, coals, cement, chalk, stone, and building wood.

Hiddensö.—From the Gellen, the southern part of Hiddensö, that island has a northeast by east direction, for 9¼ miles, to its north extreme, with a greatest width of a little more than 1 mile; near Dornbusch it attains a height of 236 feet, but southward of Kloster it is all flat and sandy.

Dornbusch consists of sandhills, some rising abruptly from the sea, and on its western slope is Kloster Village, Vitte Village being about 2 miles southward.

Leading lights.—Two fixed red and two fixed green leading lights are shown occasionally for the use of fishermen at Neuendorf Plogshagen, about the middle of the west coast of the island.

Light.—Dornbusch Lighthouse, at the northwest side of the island, is a cylindrical brown tower, 75 feet in height, with 13 dark-brown bands, and exhibits, at an elevation of 309 feet above high water, a flashing white light with a red sector, and is visible 24 miles. For bearings of sectors, see Light List.

Fog signal.—A foghorn gives three blasts every 1½ minutes, thus: Low blast, three seconds; silence, 4 seconds; high blast, 3 seconds; silence, 4 seconds; low blast, 3 seconds; silence, 73 seconds.

Storm signals are shown from a mast situated 350 yards northeast of the lighthouse, which latter has telephonic communication. (See Chapter I.)

Depths offshore.—The shore bank, within a depth of 3 fathoms, extends or 3 miles westward of the southern half of the island, being a continuation of the bank northward of Bock Sand, but it terminates in a point, about 3½ miles southwest of Dornbusch Lighthouse. The westernmost shoal spot of 3 fathoms is nearly 5 miles westward of Neuendorf Plogshagen.

From the remainder of the west coast of the island the shore bank only extends about 600 yards, as far as Kloster, but there are several isolated patches of 3¼ fathoms outside it. Along the northwest side the bank is little more than 200 yards off.

Life-saving station.—A lifeboat is stationed near Kloster, and a rocket apparatus maintained.

The Libben.—Old Bessin Peninsula is joined to the hilly north part of Hiddensö, and about 3 miles eastward of it is the Bug, a peninsula, extending about 4 miles southwest of Wittow. Between these is the Libben, a bay, with depths under 3 fathoms, which is the entrance to several channels, trending south-southwestward to Stralsund.

The pilots' watch house at Wittower, near the south point of The Bug, and Wiek and Schaprode Churches are conspicuous objects.

Spoil grounds, westward of Hiddensö and in the Libben, are marked by brown barrel buoys.

Anchorage.—The best anchorage is with Dornbusch Lighthouse beaing 329°, distant 2.2 miles; the inner anchorage is in Vitte Bay.

Harbor.—There is a small harbor on the east side of Old Bessin Peninsula, which has a depth of 6 feet, and is approached by a dredged channel 900 yards in length, with the same depth.

Wittowed Posthaus, at the southwest point of the Bug, is a customs and pilot station.

Storm signals are shown from a signal mast on the southwest gable of the head pilot's dwelling. (See Chapter I.)

Depth signals are made, according to those described (Chapter I), from a signal mast northward of the pilot watch house; a signal is always exhibited.

Channels.—From the Libben the channels to the southward, passing through Vitte Bay, the Trog, the Schaprode Bay, Middle Ground, Geller Haken Channel and Prohn Bay, are mostly about 130 feet in width, the shoals on each side being thickly overgrown with sea grass. The entrance or northern of these is dredged to a depth of 8 feet.

From Vitte Bay a channel trending eastward branches into several others leading to Wiek Bay, Breeze, Bay, etc., these being generally about 100 feet in width, and dredged to 8 feet.

Pilots.—A head pilot and five under pilots are stationed at Posthaus, and take vessels to Vitte Bay and Stralsund, pilotage for these places being compulsory; they also pilot to Breeze and places eastward.

Directions.—These inner channels are so intricate that they can only be navigated with the assistance of a pilot, or by those having local knowledge.

Approaching the Libben, and the channel leading from it to the southward, the high land of Dornbusch may be seen from a distance of 15 miles, and nearing the Libben the pilot shed at Wittower, with a small square lookout tower, and the pilot's dwellings near it, will be seen.

Entering the dredged channel, the pointed tower of Schaprode church should be kept just open westward of the pilots' watch-tower, bearing about 186°, as far as the faihway buoy, after which the channel buoys must be followed, as there are no leading marks.

Current.—With winds from west, through south, to east-southeast, a north-going current will be experienced, having a greatest rate of 3 knots; and with winds from west-northwest, through north, to east, the current sets to the southward, sometimes attaining velocities of from 4 to 5 knots.

The average rate is 2½ knots, and with variable winds it may run in opposite directions in the north and south parts of the channel.

Rugen Island—North coast.—The Bug Peninsula is connected to the northwest side of Rugen Island by a narrow isthmus, and 1 mile northward of this is Dranske Village.

Life-saving station.—A lifeboat is stationed at Dranska village, and a rocket apparatus maintained.

Coast.—From Dranska village to Cape Arkona, the coast rises gradually to the precipitous chalk cliffs of the cope; the shore bank, which is narrow, is also fairly steep-to.

Light.—Near the extreme of Cape Arkona is a cylindrical yellow tower on a red octagonal building, which exihibits, at an elevation of

246 feet above high water, a group flashing white electric light visibile 23 miles.

The old lighthouse, standing about 10 yards from the present one, is square, painted red with a brown top; the keeper's dwelling house is in front of the towers.

Fog signal.—A siren gives a blast of 5 seconds' duration at intervals of 70 seconds.

Signal station.—Cape Arkona is a State signal station, and vessels can communicate with it by the International Code; it is connected with the telegraph system.

Storm signals are hoisted on the flagstaff of the signal station. (See Chapter I.)

Ice signals.—By means of signals vessels can obtain the ice conditions on the German Baltic coast, in the Kaiser Wilhelm Canal and in Danish waters.

Tide gauge.—From observation with a self-registering tide gauge, situated on the shore under the lighthouse, the maximum rise in 8 years (1884–1891) was 3 feet, and the lowest level reached during the same period was 4 feet.

Life-saving station.—At Putgarten, a village near the lighthouse, a lifeboat is stationed and a rocket apparatus maintained.

Submarine telegraph cable.—A cable crosses to Trelleborg from a position westward of the lighthouse, its direction being marked by two beacons.

Directions.—Between Dranske and Cape Arkona vessels can approach the coast to a distance of 1,600 yards, but care must be taken, if the weather is misty, not to mistake the high land near Bakenberg for the cape.

Vessels rounding Cape Arkona will be clear of all danger by keeping 1 mile from the coast and eastward of the white beacon buoy.

For description of this coast eastward of Cape Arkona, see Baltic Pilot.

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CHAPTER XI.

THE SOUTHERN COASTS OF ÆRÖ, LANGELAND, AND LAALAND.

Marstal or Vejsnæs Bay.—Vejsnæs Nakke, the south point of Ærö, consists of low cliffs, but Lindbjerg, 1 mile northward of it, is 144 feet high; the southeast coast of Ærö to Ærö Hale is low. The southwest coast of Langeland is moderately low, with some cliffs.

The most conspicuous objects are Dunkjær Mill and Marstal Church and mill, on Ærö, while on Langeland are Ristinge Chapel, Humble Church, Hesselbjerg Mille, Tryggelev and Magleby Churches, Kjelsnor Lighthouse, and Fakkebjerg.

Vejsnæs Flat, of which Eneedorffs Ground is the shallowest part, is on a bank, with depths under 10 fathoms, which stretches about 10 miles in an east and west direction, the northern edge being about 2½ miles southward of Vejsnæs Nakke; the depths on Vejsnæs Flat are from 3½ to 6 fathoms, over sand and stones, with a least depth of 3¼ fathoms on Sneedorffs Ground.

Depths offshore.—The depths in Marstal Bay are generally from 6 to 10 fathoms, but the bottom is uneven, and nearly in the center are two patches, the shoaler of which, with a depth of 3¾ fathoms, is about 4⅓ miles from Ærö Hale; the other patch, with 4¾ fathoms, is 2 miles northwest by north of the preceding.

A tongue of shoal water, with depths under 5 fathoms, extends 2¼ miles south-southeast from Ærö Hale, and on it, at 1 mile from the coast, is a patch of 2½ fathoms; the shore bank on each side of Langö Sand extends ½ mile from Ærö Hale to Ristinge Hale.

South Channel to Marstal, see Chapter IX.

On the Langeland coast the shore bank is generally narrow, but abreast of Magleby Church and of Bakenkop Harbor it is ½ mile off.

Gulstav Flat, within a depth of 5 fathoms, extends for 4⅓ miles southward of the south end of Langeland, with a breadth of nearly 3 miles, the depths on it being from 5½ to 9 fathoms, over a bottom of sand, gravel, and small stones.

From Gulstav Cliff, which is a conspicuous bare cliff, the shore bank, under 3 fathoms, extends about ½ mile, and on the west side of that point is Snekke Ground, with ¾ fathom, and about 400 yards offshore.

Buoys.—A red conical buoy, surmounted by two upturned brooms, is moored in a depth of 4½ fathoms, ½ mile westward of Gulstav Cliff.

A similar buoy, surmounted by one upturned broom, marks the south extreme of the shore bank south of Gulstav Cliff, in a depth of 5¼ fathoms.

Submarine telegraph cable.—A cable which crosses from Ærö Hale to Ristinge Hale is marked on both coasts by two telegraph posts, each surmounted by a triangle.

Bagenkop Harbor.—The coast of Langeland, from Ristinge Hale, trends in a southerly direction, for 5¾ miles, to Bagenkop Harbor, about 2¼ acres in extent, which is formed by two breakwaters, the western with two bends, extending for 570 feet in a general north-northeast direction, the eastern, about 260 feet, extending north-northwest, with an entrance facing north, 60 feet in width, between its head, and an angle of the western breakwater.

There is a depth of 1½ fathoms in the entrance and in the harbor, but gales from northeast raise the level and winds between southwest and west lower it.

Light.—From a red square pyramidal structure, 39 feet in height, a fixed white light is exhibited at an elevation of 46 feet above high water, but it is only shown from August 1 to May 31.

Rocks.—A rock, with a depth of 2 fathoms over it, lies ½ mile northwest by north of the lighthouse, and 800 yards westward of the same is another, with 2¼ fathoms, with a third, having a similar depth to the preceding, 400 yards northward of it.

Pilot.—A pilot can be obtained.

Directions.—Bregninge Mill and Church, in line, bearing 346°, lead westward, and Bregninge Church, on Tassinge, in line with Marstal town leads eastward of Vejsnæs Flat.

Gulstav Flat forms an excellent guide when rounding the south end of Langeland, either from the westward or eastward, as any increase in depth over 10 fathoms shows that the vessel has passed that point in either direction.

If steering along the west side of Langeland, Bagenkop Point open westward of Dimes Point, bearing 357°, leads westward of Snekke Ground, in a depth of over 4 fathoms; and if passing up near the center of the bay the houses on Birkholm open eastward of the east end of Ærö Hale, 347°, leads eastward of the 3¾ fathoms patch, and 400 yards eastward of the 2½ fathom shoal a mile southward of Ærö Hale.

Anchorage may be obtained in a depth of 3¾ fathoms, northward of Bagenkop Point, with Magleby Church in line with a conspicuous hill, bearing about 67°, and Fakkebjerg in line with Bagenkop Harbor Lighthouse, 126°, avoiding a 2-fathom shoal, which is situated in the vicinity.

Town.—The town or village is situated near the harbor, and has post, telegraph, and telephone offices; fresh provisions and water may be procured.

Kjelsnor Light, group flashing white, every 20 seconds, visible 17 miles. (See Chapter VII.)

Laaland—South coast.—The south coast of Laaland is low, and as far as Hyllekrog is protected by a dyke, which passes over Kramnisse Gab, once the entrance into Rödby Fiord, but now a sluice for the overflow of its water.

Between Kramnisse Gab, where there is a harbor, and Hyllekrog, the coast consists of dry strips of land, or islands, which are connected to the land by dykes, the area inside being drained; Syltholm and Hyllekrog are the most important of these.

From Hyllekrog the coast turns to the eastward, past Nysted, to the southern entrance to Guldborg Fiord.

The most conspicuous objects on this coast are Kappel, Dannemare, Landet, Vejleby, and Nysted churches, all except Dannemare with sharp spires; Hyllekrog Lighthouse, Aalholm Castle and Beacon, near Nysted, are also landmarks.

Depths offshore.—From Vester Nes to Syltholm the shore bank, within the depth of 3 fathoms, has an average breadth of about ¼ mile, but southeast of the latter place it begins to increase its distance from the shore, and a little eastward of Hyllekrog it is 1½ miles in breadth.

On the first part of this stretch of coast there are patches of from 3¼ to 3¾ fathoms about 2 miles offshore; a patch, with a depth of 2½ fathoms, is situated 3¾ miles southeast of Hyllekrog Lighthouse, and obstructions have been reported 4¼ miles southward of the same lighthouse, so that it would be prudent to keep outside the 10-fathoms contour line, in their neighborhood, especially as the currents are uncertain, and the coast is not a good landfall.

Kramnisse Harbor is formed by two piers extending for about 400 feet in a south-southwest direction, the entrance and width between the piers being 180 feet; the depth in the harbor is 7 feet, but gales from north and northeast increase it about 5 feet, and those from southwest lower it 4 feet; also the depth on the bar outside may be 3 feet less.

Leading lights.—Fixed white and red leading lights are exhibited, at an elevation of 31 feet above high water, from poles, 16 feet in height, situated on the shore near Kramnisse; they are in line bearing about 24°, but their positions are subject to alteration according to the channel; they are shown from September 1 to November 1.

Fehmarn Belt Lightvessel.—See Chapter X.

Rödby Harbor is situated on the south coast of Laaland, about 2¾ miles southward of Rödby.

Lights.—A fixed green light, elevated 19 feet, and visible 3 miles is shown from a circular iron tower on the outer head of the south-

east mole, and a fixed red light, at the same elevation, but visible 4 miles from a similar tower on the outer head of the northwest mole.

A fixed white light, elevated 16 feet, is shown from each of the four inner moleheads.

Submarine telephone cable.—A cable crossing Fehmarn Belt from Sylt holm to Fehmarn, is marked at the former place by two telegraph posts, painted white, each surmounted by a triangle.

Hyllekrog, an island 2¾ miles in length, forming a narrow strip. is 4¼ miles southeastward of Sylt holm, and has a narrow boat channel with a depth of 2 feet, at its east end, leading into the shallow area within.

Light.—Hyllekrog Lighthouse is a square white tower, 58 feet in height, which exhibits, at an elevation of 60 feet above high water, a group flashing white light, visible 13 miles.

Rödsand, a shifting sand, with a breadth of from ½ mile to 1 mile. extends from the east end of Hyllekrog Island to Kroghage Point, a distance of 12½ miles, and fronts the shallow sheet of water, about 4 miles in breadth, which extends the whole distance within it.

The greater part of it is covered at ordinary water level, but some islands on it are always dry; these, however, change their shape and situation frequently.

Channels.—There are several channels over the sand, of which West Mærker has a depth of 5 feet, and East Mærker, about half way between Hyllekrog and Kroghage Point, has 9 feet.

Beacon.—About 5 miles from the entrance to East Mærker, and ½ mile westward of Nysted Lighthouse, is a triangular white beacon, 33 feet in height, with a black square on its lower part; it is known as Aalholm Beacon.

Buoys.—A fairway buoy, striped red and white, and surmounted by a ball, is moored in a depth of 2¾ fathoms at the entrance to East Mærker.

The channel of East Mærker is marked on the west side by two white spar buoys, surmounted by straw wisps, and on the east by two red spar buoys, with upturned brooms.

Leading mark.—Aalholm Beacon, kept midway between the sharp tower of Aalholm Castle and the truncated tower at its east end, bearing 359°, leads through East Mærker.

Depths offshore.—Eastward of East Mærker the shore bank, within a depth of 3 fathoms, extends from ½ to ¾ mile, but near the eastern end of Rödsand it increases its distance to over 1 mile.

Schönheyders Pulle, lying southward of the eastern part of Rödsand, and 4½ miles southwest by west from Gjedser Lighthouse, consists of three heads, extending about 1 mile in an east and west direction, with breadths of from 400 to 600 yards; the western patch

has 2 fathoms, the middle 2½ fathoms, and the eastern 2¾ fathoms, surrounded by depths of from 3½ to 4 fathoms.

Buoy.—A white can buoy, surmounted by three down-turned brooms, and in 22 feet water, marks the south side of the shoal.

Rödsand Channel is a dredged channel, 1¼ miles in length, at the east end of Rödsand; it has a width of 213 feet and a depth of 19 feet.

Lightvessel.—A lightvessel, having two masts, each surmounted by a ball, is moored in a depth of 4½ fathoms, about 600 yards southward of the entrance to Rödsand Channel, and exhibits, at elevations of 26 and 20 feet above sea level, a fixed red light, placed vertically over a fixed white light, shown from the gaff.

The lightvessel is only withdrawn when ice renders it necessary.

Fog signal.—At ordinary times a bell is sounded, but when the mail steamer is expected a fog trumpet gives one long blast every two minutes, a gun gives a double report, and blue lights are also burned.

Submarine fog bell.—When the ferry steamers are passing a submarine bell is sounded, giving four strokes, occupying five seconds, followed by silence for five seconds.

Buoyage—Bellbuoy.—A red bellbuoy is moored in a depth of 3½ fathoms on the east side of the entrance to the dredged channel; it is replaced, when withdrawn on account of ice, by a red conical buoy.

Lightbuoy.—Within the bellbuoy, on the east side of the channel, is a red lightbuoy, moored in a depth of 3½ fathoms, and exhibiting a flashing white light every three seconds. The west side of the dredged channel is marked by white can buoys, the outer having two down-turned brooms as a top mark, and the second buoy from the end of that side one down-turned broom.

The east side of the channel is marked by conical red buoys, the outer being surmounted by two upturned brooms.

Light.—On the east side of the north end of the dredged channel is a gray beacon, which exhibits, at an elevation of 16 feet above high water, an unwatched white flashing light, with a period of three seconds, showing a flash of half a second's duration; it should be visible in clear weather from a distance of 9 miles.

Gjedser Harbor, near the west end of the peninsula which forms the south extreme of Falster, is protected by two breakwaters, the western extending in a southerly direction for 650 feet, and then turning southeast for about 400 feet; the eastern has a southwest direction for 460 feet, and then west for 300 feet, leaving an entrance, facing south-southwest, between the heads, nearly 400 feet in width.

A central mole, with a length of about 330 feet in a southerly direction, divides the harbor into two.

The railway runs on to the quay, and there is a post and a telegraph office near the harbor.

Leading lights.—Three leading lights, which are in line bearing 349° and are visible over an arc of 6° on each side of this leading line, are shown at Gjedser Harbor.

The rear light, exhibited at an elevation of 56 feet above high water, from a black mast, 66 feet in height, and surmounted by a red and white disk, is fixed white and is visible 13 miles.

The middle light is fixed white and exhibited, at an elevation of 39 feet above high water, from a white mast, 33 feet in height, and surmounted by a triangle; it is situated on the central mole, 300 yards from the rear light, and is visible 11 miles.

The front light, exhibited from a white beacon on the east breakwater head, at an elevation of 16 feet above high water, is a fixed white electric light.

A fixed red light is shown on the west and a fixed green light on the east breakwater head.

A fixed white light is shown from the center steam ferry pier, and two pairs of fixed red lights lead to the ferry berths.

Fog signal.—During thick or foggy weather a bell is sounded from the east breakwater when the mail steamer is expected.

Depths.—The depths in the entrance and western part of the harbor are 17 feet, and in the eastern part about 12 feet, but northeast winds raise the level nearly 6 feet, and those from southwest lower it about 4 feet.

Pilots may be obtained, and can take vessels to Nysted and Nykiöbing; also to Grön Sound.

Tides.—It is high water, full and change, in Gjedser Harbor at 6h. 40m.

Steam ferry.—A steam ferry, carrying trains, crosses from Gjedser Harbor to Warnemünde.

Radio telegraph station.—There is a radio telegraph station, for the use of vessels in distress only, at Gjedser Harbor; the call letter is N.

Town.—Gjedser has a population of about 764; a post and telegraph office is situated near the harbor, and a small quantity of coal and fresh provisions may be obtained.

Falster—South coast.—From Kroghage Point the south coast of Falster trends in a southeast direction, for 2 miles, to Gjedser Point, which is low, with small cliffs; on this coast, southeast of Gjedser Harbor, are a mill, two leading beacons, a pilot's house, Frisenfeld manor house, and Gjedser Point Lighthouse, while near the southeast extreme is a beacon surmounted by a ball.

About 2 miles northward, on the peninsula, is Gjedsby Church, and 2¼ miles in a north-northwest direction from it is Skjelby

Church; 4¼ miles farther north is Vigerlöse Church, all of which form conspicuous marks.

Light.—Gjedser Point Lighthouse is a hexagonal white tower, 65 feet in height, and exhibits, at an elevation of 85 feet above high water, a group flashing white light visible 15 miles.

Fog signal.—A gun, situated 400 yards southward of the lighthouse, is fired, and a blue light is burned when the mail steamer is expected.

Radio telegraph.—There is a radio telegraph at Gjedser Point for the use of vessels in distress only; call letter N.

Dangers.—Southward of the shore bank which forms the east side of the dredged channel are several patches, which lie on the west side of the entrance to Kroghage Deep.

The outer shoal, with depths of from 11 to 17 feet, extends in an east-northeast and opposite direction, for about 1 mile, with a general breadth of 300 yards; about 200 yards westward of it is a patch of 18 feet, and within it and near the edge of the shore bank are three patches of from 13 to 18 feet.

Whistlebuoy.—A red whistlebuoy is moored in a depth of 30 feet 1,400 yards southwest of the 11-foot patch of the outer shoal.

Gjedser Reef, extending in a southeast direction for 7½ miles from Gjedser Point, consists of a number of patches with depths of from 6 to 18 feet, separated by slightly deeper water, the bottom being chalk stone covered with sand and stones; it is fairly steep on its northeast side.

For 1¼ miles from Gjedser Point it is a continuous reef, with depths of from 6 to 14 feet; this is known as Gjedser Landrev. Trindelen, situated 3¾ miles from Gjedser Point, is a patch on the reef with a least depth of 6 feet, and Outer Knoben, 1⅝ miles farther southeast, has a least depth of 12 feet, and Middle Knoben, ½ mile northwest of it, has 16 feet.

Varsko, a small patch at the extreme of the reef, has a depth of 18 feet over it.

Lightvessel.—A lightvessel, painted and masted in accordance with the Danish system is moored in a depth of 6 fathoms about 1.4 miles southeastward of Varsko; it exhibits, at an elevation of 33 feet above sea level, a group flashing white light, visible 11 miles.

Fog signal.—A fog siren gives two blasts of 2½ seconds each in quick succession every minute.

Beacons.—A beacon, painted gray, marks Kroghage Point.

A beacon, known as Gjedser Seamark, with a beehive-shaped top mark, is situated 800 yards westward of Gjedser Point Lighthouse.

A mast beacon, 72 feet in height and surmounted by a ball, stands 600 yards southeastward of Gjedser Point Lighthouse and is known as Gjedser Daymark.

Buoys.—A red conical buoy, surmounted by an upturned broom, is moored in a depth of 3½ fathoms at the southeast extreme of Gjedser Landrev.

The southeast extreme of a 13-foot patch ⅝ mile southeast of Trindelen is marked by a red conical buoy surmounted by two upturned brooms.

A red conical buoy surmounted by three upturned brooms is moored 200 yards southeast of Outer Knoben in a depth of 5 fathoms.

Current.—During calm weather the prevailing current is to the southwestward, with rates of from ¼ to ½ knot.

Kroghage Deep, the channel between Rödsand and the south end of Falster, has a breadth of about 300 yards at its entrance, southward of Gjedser Point, narrowing to about half that width within; the sides are steep-to. There is a depth of 2 fathoms about 40 yards westward of Kroghage Point, and here the channel is about 200 yards in breadth.

Depths.—The depth at the eastern entrance is 13 feet, increasing to 22 feet within and decreasing to 16 feet abreast Frisenfeldt Manor House, after which it again increases, and there is a depth of 26 feet near Kroghage Point.

Northward of Kroghage Point a small bar, with a depth of 16 feet, connects Rödsand with Falster.

Buoys.—A white can buoy, surmounted by two down-turned brooms, is moored in a depth of 16 feet, marking the east end of Rödsand and the west side of the entrance to Kroghage Deep.

A similar buoy, but surmounted by one down-turned broom, is moored on the northeast side of Rödsand and in the channel, where the depth decreases to 16 feet.

A white can buoy, surmounted by a staff, is moored in a depth of 16 feet nearly 300 yards northeast by east of the light beacon in Rödsand Channel and on the south side of Kroghage Deep.

A red and white striped spar buoy, surmounted by a ball, which marks the north end of the east side of Rödsand Channel, and two white can buoys on the northeast side of Rödsand and west of the northern entrance to Rödsand Channel, are also on the south side of Kroghage Deep.

Pilots live near Gjedser Lighthouse, and take vessels to Nysted, Nykjöbing, on Falster, also to Grön Sound.

Directons.—A vessel will be westward of Schönheyders Pulle when Vigerlöse Church is in line with the east side of Fiskebæk Wood, bearing 18°, but this course will lead over the center of a shoal northwest of Schönheyders Pulle and eastward of that shoal, with the same church in line with Skjelby Mill, 7°.

If entering through Rödsand Channel, the lightvessel will point out the entrance to the dredged channel, and the black mast, sur-

mounted by a red and white disk, east of Kroghage Point; the white mast, surmounted by a triangle, on the central mole, and the white beacon on the east breakwater head at Gjedser Harbor in line, bearing 349°, by day, or the lights exhibited from these, respectively, by night, will lead through Rödsand Channel.

Farther eastward a vessel can stand over the east end of Rödsand, in a depth of 11 feet, with Gjedser Point Lighthouse open its own breadth eastward of the pilot's house, or by keeping the west side of the lighthouse in line with the east end of the pilot's house, southeast of Rödsand, and over Rödsand, in a depth of 9½ feet.

Approaching Gjedser Reef from the southeast, Gjedser Point Lighthouse in line with the daymark beacon, bearing 307°, leads in a depth of 30 feet northeastward of all the dangers on the reef southeast of Trindelen, and Skjelby and Gjedsby Churches in line, 322°, lead clear southwest of the same dangers up to Trindelen, in 22 feet.

When the beacon on Kroghage Point is in line with the white beacon from which the light is exhibited on the east breakwater, bearing 305°, it will lead along the southwest side of Gjedser Reef, from abreast Trindelen, or a vessel would pass farther from Trindelen by keeping a house with a red roof at Gjedser Town in line with a house to the left of the seamark beacon, which will give a depth of 18 feet, until the beacons on Kroghage Point and on the east breakwater are in line, as above.

Anchorage.—Vessels can anchor in Kroghage Deep, eastward of Gjedser Harbor, in a depth of 24 feet, over sand and clay; but this anchorage is not good with onshore winds, when anchorage may be obtained north of the same point.

Banks and channels north of Rödsand.—From Stor Brundrag, opposite the northwest end of Hyllekrog Island, to Nysted, the coast of Laaland is fronted with shallow banks, and between them and the western portion of Rödsand is a small channel, with depths of from 1 fathom to 2½ fathoms.

On the banks westward of Nysted, which have depths of from 3 to 5 feet over them, there are several small islands and rocks, and from the north side of the channel, above mentioned, a branch named Lambo Fairway extends nearly to the coast, with depths of from 1¼ to 1¾ fathoms.

Klej Kulen, a basin with depths of from 2 to 3 fathoms, is situated westward of Aalholm Hestehave, southward of which point is a bank with Met Ground, a nearly dry patch, covered with stones, lying on it, the whole forming the east side of the basin, and the west side of the entrance to Nysted.

Bred Ground is a bank forming the south side of the basin, and through it is a channel, for boats, with a depth of 9 feet, and marked by perches.

Pollen, extending east-southeast from Met Ground, is a tongue of bank with depths of from 2 to 6 feet, and large stones and Rödstens-revle, Mads Pulle, Jons Ground, and several other banks, extending eastward of Pollen, are on the west side of the channel to Nysted.

East side.—The coast from Nysted trends in an east by south direction for 2¾ miles, to Flinthorne Point, which is rocky and extends nearly 600 yards southward, off which a bank extends southeastward for about 1½ miles, having on it Flinthorne Reef; this bank, on which is Skaaneholm, a small islet, forms the east side of the approach to Nysted.

Between this bank and the eastern part of Rödsand, is an area of water, about 3 miles in extent, with general depths of from 20 to 24 feet, and fairly clear of shoals.

Nysted Harbor, between the banks on either side, is about 100 yards in width, with depths of from 10 to 12 feet, and is approached by a dredged channel, 65 feet in width, and with a depth of 14 feet, there being that depth from the entrance at Gjedser; the harbor has been recently enlarged.

At the head of the harbor is a mole or quay, with depths of from 10 to 12 feet alongside, but gales from northeast raise the level about 5 feet, and those from the west lower it by the same amount.

Light.—A fixed white light is exhibited, at an elevation of 33 feet above high water, from a beacon 20 feet in height, situated on Skansehagen, the east entrance point, and is visible 6 miles. It is shown from August 16 to November 15.

Buoyage.—The channel to Nysted is marked by perches, in accordance with the Danish system. (See Chap. I.)

Pilots may be obtained, and pilot vessels from sea by East Mærker, or the channels at Gjedser; they also take vessels to Nykjöbing, and to Guldborg Sound. There are 10 warping buoys.

Pilotage is compulsory for all vessels of 11 feet draft, and of, or above, 300 tons gross register, until past Kroghage Point; also for Gjedser Harbor.

Anchorage may be obtained over all parts of the channel northward of Rödsand, according to the vessel's draft, that northward of Kroghage Point being sheltered with easterly winds, and the holding ground good, but northeast winds send in some sea, when the anchorage is better near the land, off Skjelby. The anchorage at Nysted is in a depth of 2 fathoms, over soft bottom and weeds.

Directions.—From northward of Kroghage Point the course for leading into the channel to Nysted, between Pollen and Flinhorne

Reef, is when Gjedser Lighthouse is in line with Frisenfeldt farm buildings, bearing 127°; steer 295° until Nysted Church is in line with Stubben, about 314°; steer 311°, which leads to the spar buoys marking Mads Pulle and Jons Ground, and leaving them on the port hand, when Skjelby Church is in line with the south side of Store Skaane Holm, 96°, alter to 276°; with these as a stern mark, and when Aalholm Beacon is in line with the north side of a redoubt on Skanse Hook, about 310°, steer for it, and afterward between the buoys which mark the channel.

Nysted is a small town with about 1,457 inhabitants, and on the west side of the inlet, at the head of which it is situated, is Aalholm Castle, mentioned as a leading mark; the church is also a conspicuous object from seaward.

There are post, telegraph, and telephone offices in the town, but the nearest railway station is at Nykjöbing; some coal and fresh provisions may be obtained, and water from near the harbor.

Nykjöbing.—On the north side of the area of comparatively deep water, situated northward of the eastern part of Rödsand, is Guldborg, and from it a channel trends in a north-northeast direction to Nykjöbing, which is about 7½ miles from the entrance to the channel; the greatest depth in this approach is 8 feet.

The channel to Nykjöbing is marked by perches, in accordance with the Danish system, and pilots may be obtained.

Submarine telegraph cable.—A cable connects Gjedser with Warnemünde.

Cadet Channel, a channel from 1 mile to 2 miles in breadth, and about 15 miles in length, with depths of from 11 to 15 fathoms, has a northeast and opposite direction, passing about 2 miles southeast of Gjedser Reef Lightvessel.

General directions.—From Fehmarn Belt, if intending to pass through Cadet Channel to the Baltic, a course may be shaped to pass at a reasonable distance southward of Gjedser Lightvessel, but at all times, and more especially in thick weather, the continuous use of the lead can not be too strongly impressed, as with strong winds from southwest, through west and north to northeast, the current out of Fehmarn Sound sets to the southeastward, sometimes attaining a rate of 5 knots, and the neglect of sounding might place a vessel in a dangerous position on the Mecklenburg coast; on this route it would be prudent to maintain a depth of not less than 10 fathoms.

With thick weather the southwest coast of Laaland can be followed by the lead, keeping outside the 10-fathom contour line, especially in the vicinity of Hyllekrog, and the north coast of Fehmarn should not be approached under the same depth when passing through

Fehmarn Belt, and as that depth is not far from Puttgarden Reef deep-draft vessels shsould keep outside 12 fathoms when in that locality.

The 10-fathom contour line is also a safe distance when rounding Gjedser Reef, as it passes about 1 mile southeast of the lightvessel; under a depth of 10 fathoms the bottom is generally sand, and oaze, clay, and mud, with sand in a few places, when over that depth.

Falster—Southeast coast.—From Gjedser Point the southeast coast of Falster trends to the northward for about 10 miles, to the north end of Bötö Nor, a sheet of water occupying a considerable portion of the peninsula forming the south end of Falster; this lake or lagoon is in course of reclamation. From the north end of Bötö Nor the direction of the coast changes to northeast for 9 miles, to Heste Head Point, the south entrance point to Grön Sound.

The east side of Gjedser Point consists of a low cliff, and the coast continues low, to the north end of Bötö Nor, being protected on this stretch by a dyke; for 2 miles from the dyke end the coast consists of high clay cliffs, and thence to Heste Head is wooded, with steep cliffs.

The most conspicuous objects on the southern part of this coast are Gjedsby, Skjelby, and Vigerlöse Churches, and Bötö Mansion House; on the northeast part the woods obscure the back land, but the houses of the woodmen and the chimneys of the sawmills may be easily seen, and finally, Heste Head Lighthouse is a good mark.

Depths offshore.—Except off the northern part of Bötö Nor, where the shore bank, within a depth of 3 fathoms, extends nearly 1 mile, it is from a ¼ to ½ mile off, on the first stretch of coast. Abreast of Korselitse it again draws off the coast, and Korselitse Ground, a detached patch of 2 fathoms, lies 1¼ miles offshore, with a patch of 2¾ fathoms about ½ mile north by east, and one of 3 fathoms about 1 mile northeast by east of it.

Præstebjerg Reef.—About 3 miles northeast of Korselitse is Pomle Nakke, a low, wooded bluff, and eastward of it Præstebjerg Reef extends for a distance of 1.4 miles within the 3-fathom contour line, with a breadth of about ½ mile at its outer part.

On its northeast edge is a stony patch, with a depth of 7 feet, and near its southeast side is another, of 12 feet, while a detached patch of 12 feet lies 400 yards east of its extreme; this shoal is composed of stones.

Buoy.—A white can buoy, surmounted by a downturned broom, is moored in a depth of 3¼ fathoms, 70 yards eastward of the 12-foot detached patch.

Hesnæs Bay, about ½ mile in width at its entrance, is formed by Præstebjerg Reef, on the south, and by the shore bank extending

from the coast southwest of Stubbe Hook, on its northwest side, and has depths of from 19 to 15 feet; a patch of 18 feet lies in the middle of its southern side, and on its northwest coast is Hesnæs Harbor.

Hesnæs Harbor is sheltered by two breakwaters, the southern extending southeast for about 400 feet, and the northeast, with a bend to the northeast, about 500 feet in a southeast direction, turning to the southwest for about 400 feet to its head.

Between the breakwater heads the entrance, facing southwest, is 100 feet in width, and the depths in it, and the outer part of the harbor, are 10 feet, shoaling inward, but winds from northeast raise the water 5 feet and those from southwest lower it the same.

Leading lights.—On the inner part of the northeast breakwater a fixed white light is exhibited at an elevation of 25 feet above high water, from a pole 20 feet in height.

On the end of the southwest breakwater a fixed red light is exhibited, at 19 feet, from a pole 16 feet in height. The lights in line, bearing 6°, are shown from August 1 to May 1. In line they lead clear of the eastern mole.

Pilots may be obtained at Heste Head.

Directions.—The lights in line, bearing 6°, lead over Præstebjerg, in a depth of 12 feet, and when approaching the entrance to the harbor the fixed white light should be kept slightly open westward of the fixed red light until abreast the northeast breakwater head, when the white light should be brought open eastward of the red one.

Communication.—The nearest railway stations are at either Nörre Alslev or at Nykjöbing, both 11 miles distant; the nearest post and telegraph is at Stubbekjöbing, distant 6 miles, and there is a private telephone connected with the State telephone, near the harbor.

Grön Sound, separating Falster from Möen, has its southeast entrance between Heste Head and Madses Cliff, 3 miles apart, the former point being 1 mile northeast of Hesnæs Harbor. The western portion of the sound, as far as Skanse Point, has been already described with Smaalands Farvandet.

Light.—On Heste Head is a white stone building, 14 feet in height, which exhibits, at an elevation of 45 feet above high water, a fixed, flashing, and group-flashing light, having white, red, and green sectors.

The light is fixed white, red, and green, flashing red and double flashing white, visible, the white from 12, the red from 9, and the green from 7 miles. (For bearings of sectors, and duration of flashes and eclipses, see Light List.)

Falster shore.—The coast of Falster, which forms the southwest side of the entrance to Grön Sound, trends in a northwest direction for about 3½ miles to Skanse Point, the first 2 miles being wooded.

About ¾ mile from Heste Head is the pilot's house, and nearly 2 miles farther, near the coast, Næsgaard, a high white mansion house, lies between same small woods. Nearly 1 mile north-northeast of it is the pilot's tower, 22 feet in height, and painted white, which is southward of Skanse Point.

Pier.—Near Heste Head pilot's house is a pier with a depth of 3 feet at its outer end.

Depths offshore.—From Heste Head to the pilot's house the shore bank, within a depth of 2 fathoms, is about 200 yards in breadth, but with several patches of 11 and 12 feet outside it. Beyond this, to Ablevig, a distance of 1⅞ miles, it increases its breadth to 600 yards. Ablevig, with a depth of 12 feet, lies just outside the shore bank abreast of Næsgaard.

In several places there are large rocks, the outermost being one with 2 feet midway between the pilot's house and Ablevig, which is 340 yards offshore. Gaasesand, which extends about 400 yards off the pilot's tower, has 4 feet water over it and is steep-to.

Rock.—A rock with least depth of 15 feet is located 1,560 yards 148° from the southeastern angle of Harbolle Battery.

Tolken, an extensive bank, occupying the greater part of the entrance to Grön Sound, is composed of fine white sand. It is about 2½ miles in length in an east and west direction, 1½ miles in width, and is divided into two parts. Old Tolk, the southern, and New Tolk, the northern, each have depths of from 2 to 12 feet and are connected at their eastern end by a bar, on which there is 9 feet.

Middle Ground, a detached shoal, more than 1 mile in length, and lying parallel to the coast, in a north-northwest direction, has a breadth of about 400 yards; it is composed of sand, which shifts readily, and has a least depth of 7 feet.

A patch, with a depth of 12 feet, lies ⅓ mile northeast of the center of Middle Ground and on the southwest side of the deep channel.

Buoys.—The east side of the bar connecting Tolken is marked by a red and white striped buoy, surmounted by a ball, and moored in a depth of 36 feet, and a conical red buoy, surmounted by two brooms, is moored in 26 feet on the southeast side of Old Tolk.

Stenpladerne, ⅓ mile northward of Middle Ground, and almost in the middle of the sound, has on it a rock with a depth of 9 feet, which is steep-to on the east side.

Möen shore.—Madses Cliff is small and yellow, the coast northeast of it being wooded.

From Madses Cliff the coast of Möen, forming the northeast side of Grön Sound, trends in a westerly direction for about 2 miles, to Harbölle, and then turns northwest, for nearly a similar distance, to Borgsted.

Fane Fiord extends in an easterly direction into Möen, eastward of Borgsted, and at its head is Fane Fiord Church, high, white, and conspicuous, while northward of it is Koxeby Mill, and eastward of the mill Harbölle Village.

Bonde Mill, about midway between Madses Cliff and Harbölle Point, is on a small hill ¼ mile from the beach, and northeast of Fane Fiord is Præstebjerg, a hill 157 feet high.

Harbölle Point is low, and has a battery on its western side.

Leading lights.—Three lights, forming leading lights, are shown from Harbölle Point and are known as South Harbölle.

South Harbölle.—The rear light, common to the other two, from which it is distant 250 yards, fixed white, and exhibited at an elevation of 35 feet, from a lamp-post, 29 feet in height, situated about 400 yards northward of the point; it is visible 11 miles.

The eastern front light is fixed green and exhibited at an elevation of 20 feet above high water, from a gable of a dwelling 16 feet in height and painted brown; it is in line with the rear light bearing 348°.

The western front light is fixed red, and shown at a similar elevation to the preceding from a lamp-post 16 feet in height, is in line with the rear light bearing 351°; both front lights are visible 9 miles.

North Harbölle.—See Chapter VIII.

Piers.—Near Harbölle Point are three piers, the eastern with a depth of 9 feet alongside, being 700 yards eastward of that point.

Harbölle Quarry Pier, with 18 feet alongside, is westward of the southernmost light post, and another pier, at which there is a depth of 8 feet, in northwest of the northern light structure.

Borgsted is the western point of Möen, and about a quarter of a mile eastward of it is the ferry pier, which has depths of from 5 to 6 feet alongside. (For Grön Sound Ferry on Falster, see Chapter VIII.)

Light.—At Borgsted a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 11 feet above high water, from a lantern 12 feet in height, on the gable of a brown dwelling; it is visible 7 miles.

Depths offshore.—Near Madses Cliff the shore bank, within a depth of 2 fathoms, is about 200 yards in breadth, and consists of sand and stones, but westward it increases its breadth, and between 1 mile westward of Madses Cliff and Harbölle Point is Flæske Ground, which extends about ½ mile off, with depth of from 3 to 10 feet, over sand and stones, and is steep-to on its south side to the channel.

Heste Head Deep, the principal channel through Grön Sound, has several spots in it where the depths are 11 or 12 feet and on the

shore bank are rocks with from 2 to 7 feet; the bottom in the channel is sand.

Channels.—From Heste Head Deep three channels communicate with the inner channel.

Nyt Channel, the southeastern, is a narrow channel passing in a northerly direction between the west end of Old Tolk and the southeast end of Middle Ground, and is entered on the northeast side of Heste Head Deep about 1¼ miles within its entrance; it has depths of about 13 feet.

North Channel, the next of these channels, leads out of Heste Head Deep, in a northeast direction, from abreast of Ablevig, and has depths of from 11 to 12 feet.

The third channel, westward of Stenpladerne, has a depth of 9 feet.

Madses Channel or Möens Deep passes along the coast from close southward of Madses Cliff and northward of New Tolk; it has depths of from 14 to 15 feet over sand and some stones.

Buoys.—The channels in Grön Sound are buoyed as follows:

Heste Head Deep is marked on its southwest side by a white can buoy, surmounted by a down-turned broom; it is moored in a depth of 12 feet and marks the west side of Ablevig and that side of the entrance to the channel.

The northeast side of Heste Head Deep has four buoys:

A conical red buoy surmounted by an upturned broom in 16 feet, and moored ½ mile northeast of Heste Head Lighthouse.

A conical buoy, red and white in horizontal stripes and surmounted by a ball, in 15 feet, at the entrance to Nyt Channel and marking the south side of Middle Ground.

A conical red buoy, surmounted by two upturned brooms, and a similar buoy, with one upturned broom; these are in 13 feet water on the west side of the northern part of Middle Ground.

Nyt Channel, in addition to the striped fairway buoy already mentioned, has on the west a white can buoy surmounted by a down-turned broom, and on the east side a conical red buoy surmounted by three upturned brooms; the buoys are in a depth of 18 feet.

North Channel is marked at its entrance by the two last buoys of Heste Head Deep, and on its northwest side by a white can buoy surmounted by two down-turned brooms, which is in 21 feet, and also marks the south side of Stenpladerne.

On the south side of Madses Channel are two white can buoys, the eastern, marking the northeast end of New Tolk, being surmounted by three down-turned brooms, and the western, marking the northwest end of the same shoal, by two down-turned brooms.

A conical red buoy, surmounted by an upturned broom, is moored in a depth of 24 feet on the southwest side of Flæske Ground.

Anchorage.—The best anchorage in the channel is within Ablevig, but easterly winds send in some sea.

Pilots.—The pilots live in an opening of the wood 1 mile northward of Heste Head Lighthouse, and take vessels from sea through Grön Sound, until the Bogö pilot takes charge.

Pilots also live close northward of Skanse Point Pilot Tower, and here vessels from the westward can obtain one.

Directions.—Approaching Grön Sound and entering by Heste Head Deep the high conspicuous wood surrounding Heste Head should be steered for, passing, if from the southward, eastward of the buoy marking Præstebjerg Reef, and then southwestward of the red buoy (one broom) northeast of Heste Head.

The leading mark for the channel is the first gap from westward in Bogö Wood in line with the pilot's tower, bearing 326°, the tower then being in line with a beacon westward of Skanse Point, which mark will lead in 12 feet water.

The pilot's tower can be ranged to the west side of Bogö Wood for the east side, and on the west side of the channel until it is in line with the second gap in Bogö Wood.

If intending to pass through Nyt Channel, when abreast of the pilot's house, a mile within Heste Head, steer about 357°, a little westward of Fane Fiord Church, and if the lamp-posts on South Harbölle can be distinguished the rear light post should be brought midway between the two front posts, bearing 353°.

When the buoy at the east end of Middle Ground is passed, steer for Harbölle Point until Bogö Mill is well open northeast of Skanse Point, about 307°, which will lead northeast of Stenpladerne, passing at a distance of 100 yards.

To pass through Nordre Channel, the first leading mark must be continued until the buoy marking the northwest side of Middle Ground is passed, when steer about 19° for Fane Fiord Church, and when Bogö Mill is open of Skanse Point steer for it.

By night.—Approach Grön Sound in the fixed white sector of Heste Head Light, and when Grön Sound fixed white leading lights are in line, bearing 326°, steer for them until South Harbölle rear light (fixed white) is midway between the fixed green and fixed red front lights, 347°, which will lead through Nyt Channel, and when in the fixed white sector of Borgsted Light, between 320° and 323°, alter course for it.

When Skanse Point is passed the vessel will enter the fixed white sector of light from North Harbölle, and bringing it between the fixed green and red front lights, bearing 105°, and using it as a stern mark, will lead through the western part of Grön Sound, for which see Chapter VIII.

Tidal streams—Currents.—With settled weather there is a regular flood and ebb, the water falling from 6 inches to 1 foot below mean level.

The flood is a southeast-going and the ebb a northwest-going stream, but in stormy weather the tidal stream is governed by the wind, a southeast-going stream being caused by the same winds that are productive of a south-going stream in the sound and Great Belt.

In the narrow part of the sound, at Harbölle Point, the streams sometimes attain a rate of from 3 to 4 knots.

In unsettled weather, especially in spring, the water may fall 2 feet below mean level, southerly winds causing low and those from the northward high water.

Hjelm Bight.—From Madses Cliff the south coast of Möen trends to the northeastward, and then curves round to east-southeast, forming Hjelm Bight, about 10 miles in breadth, with depths of from 5 to 12 fathoms, over a bottom chiefly of sand. The land on the western side is somewhat high and steep in places near the sea, but to the eastward it is low.

The most conspicuous objects are Hjelm Cliff, a white cliff; Hjelm Mill; the church and the chimneys of the sugar factory at Stege; also Elmelunde, Borre, Magleby, and Klintholm Churches.

Depths offshore.—The shore bank only extends a short distance off the coast, the 5-fathoms contour line from ½ to 1 mile, and the 10-fathom line about 2 miles. A few rocks lie on the shore bank, and outside it the bottom is gravel, with pebbles and reddish sand, but farther out it is mud.

About 2½ miles eastward of Madses Cliff is a rocky shoal, with a depth of 21 feet, which is 1 mile off the coast southward of Hjelm Cliff.

Bochers Shoal is small, and has a least depth of 18 feet; it is steep-to on all sides, and lies about 3½ miles southward of Stege Church.

Bjelkes Flat, with a least depth of 21 feet, extends about 1¼ miles southward of the southeast point of Möen.

Klintholm Harbor, on the east side of the bight, about 2¾ miles west by north from Möen Southeast Lighthouse, is formed by a breakwater, about 850 feet in length in a south-southwest direction, which curves around to west-northwest for nearly 400 feet. About 150 yards westward, and parallel to the first part of this breakwater, is the western breakwater, about 720 feet in length, the entrance from the westward being 65 feet in width. There is a pole on the outer end of the eastern breakwater.

The harbor is divided into an outer and an inner harbor by short arms from either side, and the depth in the outer is 1¾ fathoms, and

in the inner 1½ fathoms, the depth in the entrance being the same as that of the outer harbor, but gales from east-northeast raise the level of the water, and those from west-northwest lower it.

Light.—A fixed red fishing light is exhibited from a post on the west breakwater head at an elevation of 14 feet above sea level, but it is only shown from August 20 to the middle of November.

Communication.—The post office is at Borre, distant 4 miles; the telegraph at Stege, 8 miles, where are daily posts to the latter place.

Supplies of fresh provisions may be procured at a distance of about 1 mile, and water from a well near the harbor.

APPENDIX.

Average ice conditions, and first and last dates of ice seen in the Kattegat, sound, belts, and in ports on the German coast, four years: 1904–1909.

Place.	Navigation unimpeded.	Navigation difficult for sailing vessels.	Navigation closed for sailing vessels.	Navigation difficult for steam vessels.	Navigation suspended.	First report of ice in the period.	Last report of ice in the period.
Kattegat:							
Frederikshavn	7	1	0	0	0	Dec. 31	Mar. 10
Mariager Fiord	6	15	13	18	22	Nov. 17	Apr. 4
Randers Fiord	12	15	20	2	0	Nov. 16	Mar. 20
Grenaa Harbor	1	1	4	0	0	Mar. 2	Mar. 24
Aarhus Harbor	10	6	0	1	0	Dec. 27	Mar. 17
Horsens Harbor and Fiord	2	10	18	3	2	Dec. 19	Mar. 27
Sound:							
Helsingör Harbor	4	4	4	0	0	Jan. 2	Mar. 16
Copenhagen	6	5	6	2	1	Dec. 29	Mar. 25
Kjöge Bay	0	2	6	0	8	Dec. 29	Mar. 30
Great Belt:							
Kallundburg Fiord	2	3	6	2	0	Feb. 11	Mar. 17
Kjerteminde Bay	1	1	2	1	4	Jan. 24	Mar. 26
Nyborg Harbor	4	6	3	0	0	Dec. 30	Mar. 30
Nakskov Harbor	8	5	32	0	0	Dec. 10	Mar. 20
Little Belt:							
Vjele Harbor and Fiord	8	15	13	11	0	Nov. 14	Mar. 31
Fredericia Harbor	20	0	0	0	0	Nov. 28	Apr. 10
Kolding Harbor and Fiord	3	22	19	2	0	Nov. 21	Mar. 29
German Coast:							
Hadersleben	7	17	6	.....	.....	Jan. 3	Feb. 5
Flensburg	3	6	3	.....	.....	Jan. 13	Mar. 9
Kaiser Wilhelm Canal	5	14	11	.....	.....	Jan. 3	Feb. 1
Brunsbüttel (west end of canal)	22	3	.....	.....	.....	Jan. 3	Feb. 5
Kiel	2	.....	.....	.....	.....	Jan. 15	Jan. 17
Travemunde	8	5	18	.....	.....	Dec. 31	Feb. 18
Warnemunde	5	32	7	1	.....	Dec. 24	Feb. 20

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